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ABSTRACT

A study tested the effects of using a graphic advance organizer before, during, and after reading on the comprehension of written text. Subjects were 197 sixth-grade students who were assigned to a graphic advance organizer group or a reading-only control group and who were also designated as below-level, at-level, and above-level readers. The treatment groups were given the graphic advance organizer to use before, during, and after reading. The control-group students simply read the text. Multiple-choice tests were given after completion of each unit, after completion of all units, and one week after completion of all units. Results indicated that the graphic advance organizer did not facilitate comprehension of single-theme text, but it did facilitate comprehension of multithematic text. The findings also showed that the graphic advance organizer strengthened retention of content and that readers at all three ability levels benefited similarly. (Author/MKM)

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Technical Report No. 545

# THE EFFECTS OF USING A GRAPHIC ADVANCE ORGANIZER BEFORE, DURING, AND AFTER READING ON THE COMPREHENSION OF WRITTEN TEXT: A STUDY CONDUCTED WITH SIXTH-GRADE STUDENTS

by

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Report from the Project on
Studies in Language: Reading and Communication

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THE EFFECTS OF USING A GRAPHIC ADVANCE ORGANIZER BEFORE, DURING, AND AFTER READING ON THE COMPREHENSION OF WRITTEN TEXT

Carol Marie Dana

Under the supervision of Professor Wayne Otto

## Abstract

The purpose of this study was to test the effects of using a graphic advance organizer before, during, and after reading on the comprehension of written text. A graphic advance organizer has been defined as a visual/verbal presentation of key vocabulary in a new learning task, in relation to broader, more inclusive terms (presumably) understood by students. To determine the usefulness of the graphic advance organizer three questions were posed: (1) Does the use of a graphic advance organizer with text facilitate comprehension? (2) Does the use of a graphic advance organizer with text facilitate delayed comprehension? (3) Do students classified as below-level, at-level, and above-level readers benefit similarly from using a graphic advance organizer with text?

To answer these questions an experiment was conducted with 197 sixth-grade students in a middle school in western Wisconsin. The students were assigned to a graphic advance organizer group or a reading-only control group. Using the results from the reading subtest of the Iowa Standardized Achievement Test obtained from the

school records, students were stratified into below-level, at-level, and above-level readers. Four teachers participated in the study. Each teacher worked with two groups of students, a class of treatment-group students and a class of control-group students. The treatment-group students were given the graphic advance organizer to use before, during, and after reading. The control-group students simply read the text. The text consisted of units on different ecosystems--desert, tropic island, and city. Students completed the materials at their own pace. After a student completed reading a unit, he was given a multiple-choice subtest covering the content of that unit. Upon completion of all the units, the four subtests were scored to yield the composite-comprehension test score. A comprehensive-comprehension test was given after all the units were completed. This multiple-choice test covered the content in all the units. One week after completing the comprehensive-comprehension test, each student was given ten minutes to review either the organizer if he was a treatment-group student or the text if he was a control-group student. The student was then given a short-answer delayed comprehension test. The scores from the composite, comprehensive, and delayed comprehension tests were analyzed in order to answer the three questions.

To analyze the data three analyses of variance were performed, one with the scores from each comprehension test. The scores that were used in the analyses had been randomly sampled from the tests of the treatment and control groups. Findings from the analyses of

variance were used to answer the three questions.

In answering the first question on whether a graphic advance organizer facilitates comprehension, the findings indicated that although the graphic advance organizer did not facilitate comprehension of single-theme text, it did facilitate comprehension of multi-thematic text. In answering the second question on whether the use of a graphic advance organizer with text facilitates delayed comprehension, the findings showed that the graphic advance organizer strengthened retention of content. In answering the third question on whether below-level, at-level, and above-level readers benefit similarly from the use of a graphic advance organizer, the results indicated that all three levels benefited similarly.

APPROVED: Wayne Otto

Wayne Otto

DATE: June 3, 1980

# CHAPTER I

## BACKGROUND, PURPOSE, AND RATIONALE

The primary goal of all reading programs is to develop students' ability to comprehend what they read. The results of a literacy study conducted by Hansen and Hesse (1974) show that this goal is not being reached: 30 percent of the graduating seniors of a midwestern school system could not comprehend assigned materials such as newspaper articles, textbook passages, and reference materials. Other research results suggest that the student reading deficiencies reported by Hansen and Hesse are not limited to the individuals in the midwest, but are instead a national problem (Satz, 1977). How can students be helped to become better readers? One possible approach is to improve reading instruction by supplying teachers with instructional strategies that have been proven effective in strengthening reading comprehension.

Research in education can be a basis for developing effective instructional strategies. A line of research in which methods of improving reading comprehension have been investigated has focused on prose-learning strategies. Strategies range from changing the text to changing the behavior of the learner. Text changes may include rewriting the text or appending it with aids such as questions, objectives, or organizers. The learner's behavior may be changed by

teaching him how to use self-imposed strategies such as paraphrasing and imaging. The present study is a continuation of the prose-learning research.

The purpose of this study was to determine if using a graphic advance organizer before, during, and after reading would improve students' comprehension of written text. A graphic advance organizer has traditionally been used before reading as a preview of text that serves to prepare the student for reading. In the present study the organizer was also used during reading to guide the student through the content and after reading to strengthen the retention of the content. The investigator developed the graphic advance organizer by first identifying key vocabulary terms and phrases that represent the main ideas in the text. These terms and phrases were used as headings and were arranged to form a word chart that represented the organization of the content. Lines and arrows were used to connect the headings to illustrate how the main ideas were interrelated. The resulting graphic organizer formed a skeletal representation of the text. Students were shown the graphic advance organizer (Figure 1) before reading to prepare them for reading the text. They were told what an organizer is, why it is used, and how it is used. On the organizer, space was provided with each heading so that while the students read they wrote in facts that developed the main ideas. This writing activity served to guide the students through the content. Multiple-choice comprehension tests were given to determine the effects of the organizer on immediate comprehension. One week after reading the text, the students

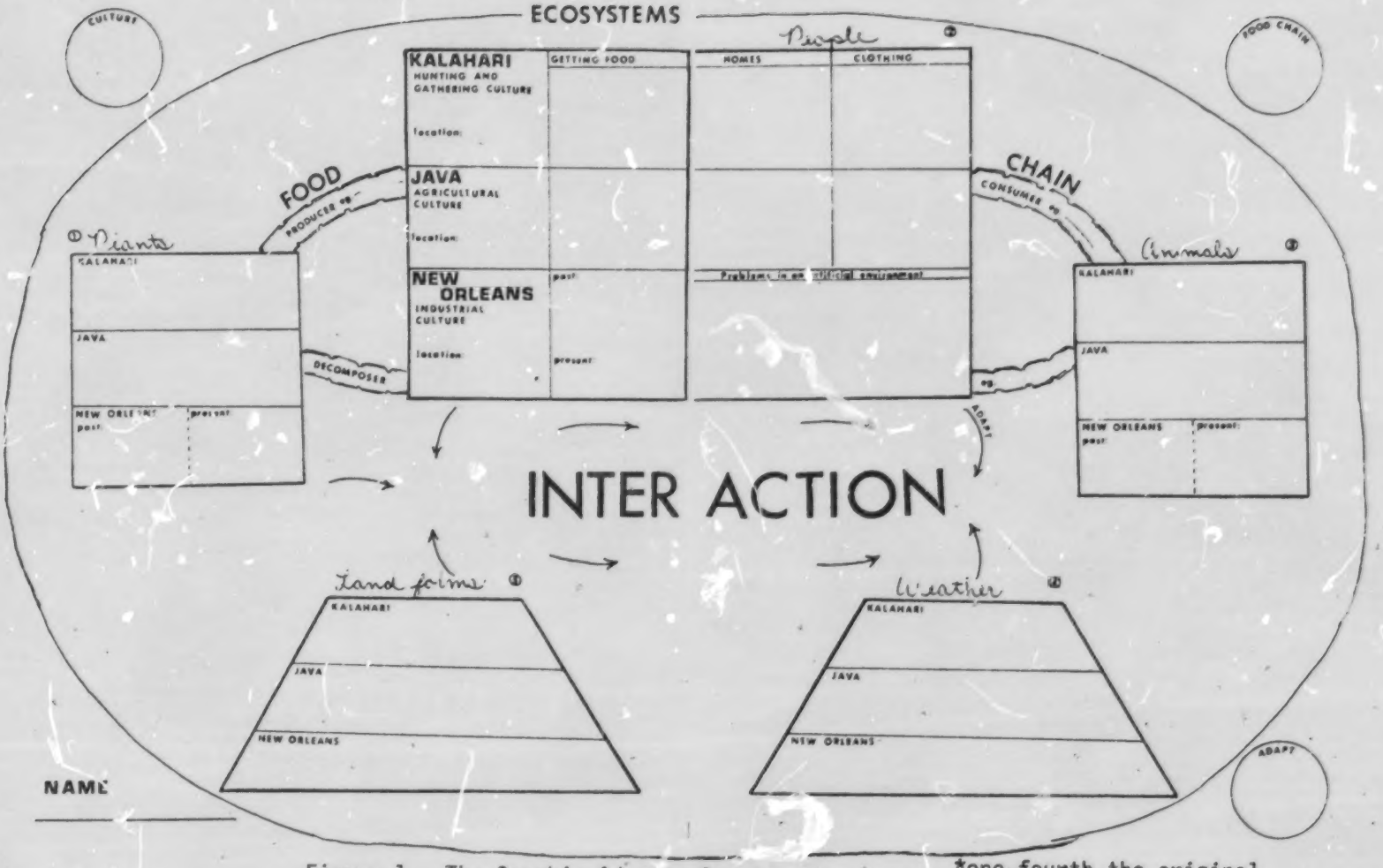


Figure 1. The Graphic Advance Organizer*

*one-fourth the original size

reviewed the organizer to strengthen retention of the content. The effects of the graphic advance organizer on delayed comprehension were measured by a short-answer comprehension test.

## Background to the Problem

In the research on learning from prose, several strategies for improving students' reading comprehension have been investigated. The strategies can be grouped into three categories: (1) changing the structure of text, (2) employing adjunct aids with text, and (3) developing learner-imposed techniques. The first two categories involve manipulation of instructional materials by educators. Changing the text structure requires rewriting the text to lower the readability level or reorganizing the materials in some way to facilitate learning. Employing adjunct aids requires the addition of behavioral objectives, questions, or advance organizers to focus the attention of the learner on specific content. The third category requires training students in techniques that they can use to improve their ability to comprehend textual materials. Such techniques include underlining, imaging, summarizing, note-taking, outlining, and paraphrasing.

Changing the structure of text has been shown to facilitate comprehension. Corey (1977) rewrote a set of materials to lower the readability level of the text. Subjects who read the rewritten text achieved higher scores on a content-related comprehension test than

did the control group who read the original version. Ruddell (1965) and Peltz (1973-74) found that adapting the sentence structure to the oral patterns commonly used by the reader made the text more understandable for the student.

In order to improve the text readability, completely rewriting text is not always necessary. Research in which only minor adjustments were made to the structure of the text indicates that even small changes can improve comprehension. Arranging the sentences in text so that the order of events is in logical rather than inverted sequence (Clark & Clark, 1968; French & Brown, 1976) and organizing materials so that concepts are followed by their attributes (Schultz & DiVesta, 1972) are two structural modifications that have been found to enhance comprehension.

Cromer (1970) changed the physical structure of text by reprinting passages with spaces between grammatical phrase units in all the sentences. Subjects reading the modified text, who formerly exhibited word-by-word reading behavior, were able to see how the words should be grouped and could more readily follow the organization of the text.

Adjunct aids form the second category of strategies that can be used to improve comprehension. They may be used with text as orienters, directing the students to the specific content of text. Instructional objectives are one type of adjunct aid. Kaplan and Rothkopf (1974) found that learning was improved by using instructional objectives with text. Results of a series of studies showed that objectives promote learning of content directly related to the

objectives and that objectives are most effective when they are distributed within the text rather than presented all together (Kaplan, 1974; Kaplan & Simmons, 1974; Rothkopf & Kaplan, 1972). Another adjunct aid, the merits of which have been explored extensively, is questioning. Research results indicate that questions facilitate learning of textual information (Anderson & Biddle, 1975; Boker, 1974; Frase, 1968; Rothkopf & Bisbicos, 1967). Singer and Rhodes (1975), summarizing the research on questioning, state that preposed questions tend to facilitate selection and storage of question-specific information, while post questions enhance retention of both question-specific information and general information.

A third adjunct aid that can be used is an advance organizer, a preview of the content to be found in text. Ausubel (1978, pp. 171-172) contends that the principal function of the organizer is to bridge the gap between what the learner knows and what he needs to know before he can learn the task at hand. An advance organizer can be constructed two ways: a prose advance organizer, which is a written passage presented as an introduction to the text; or a graphic advance organizer, which is a diagram of the text content.

Results of Ausubel's research on the advance organizer support the use of this adjunct aid with text (Ausubel, 1960; Ausubel & Fitzgerald, 1961, 1962; Ausubel & Youssef, 1963). However, Barnes and Clawson (1975) report that research by other investigators on the facilitative effect of the advance organizer on learning has resulted in mixed findings with some researchers reporting that the

instructional aid improved comprehension and others reporting no significant improvement.

In the first two categories of prose-learning strategies, attention is centered on the text, either changing its structure or appending it with adjunct aids. In the third category the focus is on the learner, and an attempt is made to change the behavior of the learner while reading. One strategy the learner can be encouraged to use is imaging. Forming visual images of text content while reading appears to assist the reader in understanding a passage (Anderson, 1974). Levin (1973), in a study with fourth graders, found that encouraging a group of students to image while reading improved their comprehension. Another learner-imposed strategy which has also been found to assist readers in learning from text is paraphrasing (Doctorow et al., 1978; Pio & Andre, 1977).

Underlining, outlining, note-taking, and summarizing are also included in the third category. Research by Stordahl and Christenson (1956) and Brown and Smiley (1977) indicates that although students who are good readers use strategies of outlining, underlining, and note-taking, students who are poor readers cannot. Being able to effectively outline, take notes, and underline presupposes that the student is able to understand the text content and organization.

Researchers have studied prose-learning strategies that can be used in classroom instruction. Strategies range from changing the text to changing the behavior of the learner. A need exists for

continued research on the development, testing, and refinement of effective prose-learning strategies.

## The Problem

The present study was a continuation of prose-learning research and is directly related to the research on adjunct aids. A prose-learning strategy is typically used at one stage of the reading process, either before, during, or after reading text. A logical question is whether the effectiveness of a strategy would be improved if the strategy was used during all three stages. When used before reading, the strategy would be used to prepare the student for reading the materials. During reading, the strategy would serve to guide the reader through the content and focus his attention on the major concepts. After reading, the strategy would be used to strengthen retention of the content. Using the strategy during all three stages would maximize the guidance given to the reader.

In the present study, to determine whether or not increasing students' use of a strategy improves reading comprehension, students were given a graphic advance organizer to use during all three stages. A graphic advance organizer was selected as the strategy to test because its design is adaptable for use before, during, and after reading. The purpose of the study was to examine the effects of using a graphic advance organizer before, during, and after reading on the comprehension of written text.

Graphic advance organizers have been defined as "visual and verbal presentations of the key vocabulary in a new learning task in relation to subsuming and/or parallel terms that presumably have previously been incorporated into the learner's cognitive structure" (Estes, Mills & Barron, 1969, p. 41). A graphic advance organizer can be conceived of as a skeletal outline of the main ideas found in a text presented in terms that a student can understand. To develop a graphic advance organizer, Barron (1972) states that first the instructor must analyze the vocabulary taken from a text and identify the key vocabulary the student must know in order to understand the text. The key terms are then arranged into a scheme which depicts the interrelationships among concepts. Next, vocabulary terms that are familiar to the students are added to the scheme in order to illustrate relationships between the learning task and the discipline as a whole. Then the instructor evaluates the organizer for clarity and appropriateness. The instructor introduces the students to the learning task by displaying the organizer and explaining it to them.

The view of comprehension in the present study includes both learning (acquiring meaning) and retention (maintaining availability of meaning) of content from expository prose which is the view of comprehension commonly held by content-area instructors. The level of comprehension that was investigated in the study was literal comprehension of content. Literal comprehension is the recognition of information that was explicitly stated in the text (Smith & Barrett, 1976). Literal comprehension is what Carroll (1971) refers to as

understanding the "plain sense" of the message.

The graphic advance organizer was used to relate new knowledge to knowledge the student already possessed, and to facilitate students' comprehension by helping them organize content while reading. This reading behavior is in line with the definition of comprehension that was used for this study:

> Comprehension of prose whether written or oral, involves considerably more than understanding the meanings of individual words and sentences; it also requires that one understand how the ideas expressed in one sentence are related to the ideas expressed in other sentences. An even more critical component of comprehension is the knowledge that one brings to the reading situation. (Baker & Stein, in press)

In this study, which was conducted with sixth-grade students, three questions guided the investigation:

1. Does the use of a graphic advance organizer with text facilitate immediate comprehension?
2. Does the use of a graphic advance organizer with text facilitate delayed comprehension?
3. Do students classified as below-level, at-level, and above-level readers benefit similarly from using a graphic advance organizer with text?

## Rationale

Based on the three questions posed, the rationale is a discussion of the lines of research related to each question: (1) investigations supporting the use of graphic advance organizers before and during

reading to facilitate immediate comprehension of written text; (2) studies supporting the use of graphic advance organizers after reading to facilitate delayed comprehension of written text; and (3) examinations supporting the investigation of graphic advance organizers with students of varying levels of reading competence.

## Graphic Advance Organizers to Facilitate Immediate Comprehension

Research to support the use of a graphic advance organizer to improve immediate comprehension comes from two areas: research on the advance organizer and research on the importance of organizing concepts while reading.

### Advance Organizer Research

In the discussion of advance organizer research, first, the advance organizer construct is discussed; second, the problems that have been encountered in advance organizer research are examined; and third, the plan for dealing with these problems in the present study is presented.

The advance organizer. Ausubel (1978) develops a logically compelling theoretical rationale for the use of an advance organizer to facilitate comprehension. He contends that "the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly" (p. 163). To assist a student in learning new materials he suggests linking the information to be learned with information the student already knows. To make the

link he proposes the use of an advance organizer, a preview of text, to bridge the gap between what the learner knows and what he needs to know in order to learn the task at hand. The advance organizer is presented as an introduction to the materials to be learned and is written in terms that are more general, abstract and inclusive than the actual learning materials. The terms that are used in advance organizers must be familiar to the learner so that he can use the terms as a framework to which new information can be related. Ausubel (1978, p. 172) explains that an advance organizer provides "ideational scaffolding for the stable incorporation and retention of the more detailed and differentiated material that follows in the learning process" (p. 172).

In addition to facilitating learning, Ausubel (1978, p. 174) claims that an advance organizer aids in retention. The familiar terms in an advance organizer act as subsumers which take in the new knowledge and anchor these concepts to the learner's existing knowledge base. The stability given to the new information strengthens retention. The advance organizer is also used to differentiate between the newly acquired information and the existing knowledge. The emphasis on the distinctive features of the new information further strengthens retention.

Initial advance organizer research affirmed the effectiveness of the strategy to facilitate learning (Ausubel, 1960; Ausubel & Fitzgerald, 1961, 1962; Ausubel & Youssef, 1963). Subsequent research resulted in mixed findings. Studies by Clawson and Barnes (1973),

Jerrolds (1972), and Lucas (1972) provide no support for the use of an advance organizer with text. Results of studies by Groteluesch en and Sjogren (1968), Kuhn and Novak (1971), and Steinbrink (1970) suggest that advance organizers generally facilitate learning.

In an attempt to resolve the issue of whether or not advance organizers facilitate learning, several reviews of the literature have been conducted (Baker, 1977; Barnes & Clawson, 1975; Faw & Waller, 1976). Barnes and Clawson (1975) found that "of the 32 studies reviewed, 12 reported that advance organizers facilitate learning, and 20 reported that they did not" (p. 651). From their review they concluded that "advance organizers as presently constructed, generally, do not facilitate learning" (p. 651). Baker (1977) also noted that a majority of advance organizer studies conducted since Ausubel's early investigations reported nonsupportive findings. Both the Barnes and Clawson review and the Baker review reported conclusions not favoring the use of advance organizers based on the fact that the majority of advance organizer studies did not have significant results.

In a reply to the Barnes and Clawson review, Lawton and Wanska (1977) point out the following limitations of the review: (1) incorrect interpretation of Ausubel's theory in the introduction, (2) comparison of highly divergent studies, (3) no consistent rationale for inclusion of studies reported in their tables, and (4) lack of independence among several of the studies that were cited. Mayer (1979) has also raised arguments against the review by Barnes and Clawson and has presented results from a series of nine carefully controlled

studies which he uses to uphold the premise that "advance organizers, when used in appropriate situations and when evaluated adequately do appear to influence the outcome of learning" (p. 381). Faw and Waller (1976) support Mayer's premise. In their review of the advance organizer research they not only attended to the results of the studies but also evaluated the construction of the organizers. They concluded that "when the materials to be learned are particularly difficult or novel, or when the subjects' ability is limited with respect to the passage being learned, organizers that are general and abstract can facilitate retention of the materials" (p. 695).

Problems drawn from advance organizer research. The first problem noted in the advance organizer research is that improperly constructed advance organizers are frequently used. Ausubel (1978, p. 177) states that many researchers have not correctly implemented the advance organizer strategy. He states that before constructing their advance organizers many researchers have not analyzed both the learner's relevant knowledge and the concepts to be learned in the written materials. Without carrying out these essential steps, an adequate advance organizer could not be constructed. Faw and Waller (1976) have come to a similar conclusion on the inadequate design of many organizers used in research. They have analyzed advance organizers used in research and found that in many of the studies researchers have not constructed advance organizers according to the instructions related by Ausubel. Many researchers have not made the organizers more general, abstract and inclusive than the subject matter the organizers are designed to

introduce. Since in many research studies improperly constructed advance organizers have been used, the results of these studies become questionable.

A reason for the improperly constructed advance organizers appears to stem from a limitation in the information that Ausubel has written on how to construct the organizers. Critics found that a major weakness in the advance organizer construct is the lack of an adequate operational definition (Barnes & Clawson, 1975; Barron, 1972; Blanton & Tuinman, 1973; Hartley & Davis, 1976). This lack of an adequate operational definition could account for many incorrectly constructed advance organizers which when tested in research would lead to findings that would not validly reflect the effects of Ausubel's advance organizer construct.

A second problem with the advance organizer research is that some students do not understand the intended use of the organizer. Barron and Stone (1974) report, that in a debriefing session in a previous organizer study, students reported that rather than reflecting upon the organizer's content in relation to the more specific ideas in the learning passage, they treated the organizer as an additional discrete piece of information. In order to ensure that students understood the intended use of the organizer, Jerrolds (1972) included sessions during which students were taught how to use advance organizers. He included both an instruction and a no-instruction condition. Although no significant difference was found to support his general hypothesis

that instruction on how to use an advance organizer would facilitate retention of facts, comparisons showed that for several stratified groups the subjects benefited significantly from instruction. Training students on how to use an advance organizer effectively warrants additional investigation.

Rickards (1976) contends that another problem with the conventional prose advance organizers is that they possibly represent a "mentally cumbersome and unwieldly processing situation, in which case, they may not have been adequately stored in memory while learners read related subordinate materials" (p. 619). He found that interspersing advance organizers in the text led to significantly more facts being recalled. His organizers consisted of 10 to 12 word sentences placed before selected segments in the text. The difficulty with Rickards' use of prestatements as advance organizers is that the materials must be rewritten in order to incorporate the organizers into the text.

The fourth concern drawn from the advance organizer research also comes from Rickards (1976). He contends that a plausible reason for the non-facilitative effects of the advance organizers in many studies may be that organizers with single-theme passages are used. Rickards reports that students may not have difficulty understanding the content of a passage that is written about one major theme, so supplying the readers with an organizer is immaterial to the subsumptive process. However, when students encounter multi-thematic materials they may have problems comprehending the content and an organizer serves to facilitate

comprehension. Rickards employed multi-thematic text in his advance organizer study and reported significant results. Bransford, Johnson and Raye, using a passage with only one major topic, did not report significant differences (Bransford & Johnson, 1973).

Blanton (1972), noting a fifth shortcoming with advance organizer research, criticizes the testing procedures that have been used. He states that many investigators have neglected to report statistics for the tests in their experiments. The tests have been very short, approximately six to fourteen items, and it has been difficult to determine if the measures were reading dependent. Recommendations by Barnes and Clawson (1975) for improving testing in advance organizer studies include following established procedures for test construction and maintaining high reliability and validity. They also suggest using a retention measure, if possible, and employing various test formats such as recall and recognition.

Addressing the problems. Five weaknesses in advance organizer research are the following: (1) the lack of an adequate operational definition for an advance organizer; (2) failure to inform students of the intended use of an advance organizer; (3) the fact that an advance organizer may be too difficult for a student to hold in memory when reading the text; (4) the possibility that an advance organizer may not aid comprehension of a single-theme text; and (5) the limitations in the testing procedures employed in many of the studies.

The lack of an adequate operational definition for an advance organizer and the need for informing students about the intended use of

an advance organizer have been addressed in the present study by employing a graphic advance organizer (Barron, 1969). Ausubel (1969) regards a graphic advance organizer as a special form of advance organizer. Barron has operationally defined the graphic advance organizer and in the definition includes time for the teacher to explain the use of the organizer to the students. Barron includes this time for explanation in his model for two reasons: (1) students can be told what the organizer is and how it should be used, and (2) the organizer can be tested to see if it has been appropriately designed in relation to the students' existing background knowledge. If the organizer does not appear adequate, modifications can be made immediately by the instructor.

Estes, Mills and Barron (1969) conducted two related studies to determine the usefulness of a graphic advance organizer (structured overview) in content-area classes. The studies were conducted with ninth-grade students. The first study dealt with language-arts materials. The results of that study showed no significant difference between the treatment and control groups. The second study was conducted with science materials and yielded significant differences favoring the group using the structured overview.

Earle (1969, 1970) in two studies with seventh-grade students, investigated the effects of structured overviews on math achievement. Immediate results showed no significant differences in content tests. Results of delayed tests, however, showed marked differences favoring the graphic advance organizer group.

Barron (1971) found significant differences between a structured overview group and a control group of tenth-grade biology students on tests measuring knowledge of biology terms presented in the experiment. Results of a test on the general content did not show differences.

Subsequent graphic advance organizer research did not yield statistically significant differences between control and treatment groups. Barron (1972) worked with students in grades six through twelve who were assigned to a prose organizer condition, graphic advance organizer condition, or control condition. The materials used were held constant across seven grade levels. Analysis of the data indicated no significant differences between the two organizer groups and the control group at any of the seven grade levels. Estes (1972), in a study with high school students, compared three groups (prose advance organizer group, graphic advance organizer group, control group) and found no significant results in favor of any group. Although his results were not statistically significant, Estes found the graphic advance organizer group performed consistently better than the prose organizer group at each ability level. Barron and Cooper (1973) identified subjects in grades eight through eleven for whom the selected learning passage represented an instructional reading level. An analysis of the data from the prose organizer group, graphic advance organizer group and the control group showed that there was no significant treatment effect. These three studies, which did not yield significant results, may indicate that the operational definition of the graphic advance organizer model does not in itself offer enough

guidance to lead to the development of an effective instructional strategy to improve comprehension.

The present study was a continuation of the graphic advance organizer research. Barron's directions were strictly adhered to. Instructors introduced the graphic advance organizer to the students to show the students how to use the organizer to help them learn and retain content. One major change was made to the graphic advance organizer model in an attempt to make it more effective. The change was made in order to deal with the third problem found in advance organizer research.

Students appear to have difficulty holding the advance organizer in memory while they read the text for which the organizer was designed. If the students have difficulty remembering the organizer, it may not prove useful in helping them to understand the passage. Responding to this concern, students in the present study were directed to fill in the graphic advance organizer while they read. The organizer consisted of headings representing the major concepts in the text. These headings were arranged into a diagram of the content structure. In the introduction to the organizer, the teacher presented the major concepts so that the students knew what they were and where they were located on the organizer. While the students read, they filled in facts that developed the major concepts. This use of the organizer during reading was the change that was made to the graphic advance organizer model. The activity of having the students write on the organizer follows a suggestion made by Smith (1973) who points out

the need for comprehension techniques that are not just another part of an all too often passive reading operation. By writing on the organizer the students were called upon to take an active role in the reading task.

The fourth concern that was drawn from the research was that students may not need an organizer for a single-theme passage but may require the organizer for a multi-thematic passage. This concern was addressed by using two separate tests to measure comprehension, a composite-comprehension test and a comprehensive-comprehension test.

The composite-comprehension test was a collection of four short subtests. A subtest was given after a student completed reading each of the four units in the text. Each subtest contained items that were directed only at the content of the unit the student just finished reading. Thus, each short test measured knowledge of one major theme at a time. The scores from the four subtests were combined to yield the composite-comprehension test score. This test score represented the testing of single-theme content.

The comprehensive-comprehension test was given after all the units were completed. This test contained items that measured knowledge of content specific to each individual unit and also items that measured knowledge of content common to all four units. Since the test covered all four units, it measured knowledge of multi-thematic content.

The fifth problem that was found in advance organizer research was in the testing procedures that were used. This problem was addressed in the present study by adhering to established procedures for test

development and by reporting test reliability and validity. Also, in line with the suggestions made by Barnes and Clawson (1975), a retention test as well as recognition and recall measures were used.

## Research on Organizing Concepts While Reading

The second line of research that lends support for the use of a graphic advance organizer is Smirnov's (1973) research in which he found that organizing concepts while reading facilitates learning. His findings are supported by comments of other researchers.

Smirnov (1973) reports on research conducted to study the human memory processes. In these studies, adults and children were given materials to read and were directed to retain the information. In a series of introspective interviews the subjects reported the mental activity they used while processing the information. The activity identified most frequently by subjects was "breaking up" the materials into parts while reading and then organizing the information to form a plan of the content. Smirnov reports subjects' responses:

> The dividing into parts occurred during the process of reading itself not as a separate process, but as an accompaniment of what had been read.
>
> The breaking up into parts occurred during reading. These processes are very difficult to separate. In essence the process of reading and dividing into sections is the same. (p. 160)

In his research, Smirnov has found that most adults generate an organizational plan of content while they read, but elementary school students do not.

The importance of organizing facts while reading has been

supported by many authorities. Tulving and Donaldson (1972) assert that learning will be facilitated to the extent that the learner is able to adopt, or construct, an organizational scheme during learning which can act as a specific retrieval plan. Students need a framework in which to store their information; otherwise they will be left with a mere array of facts that do not cohere to form meaningful patterns (Bransford et al., 1977). Levin (1972) sums up as follows:

> Equipped with efficient organizational strategies, the child will be less dependent on the quality of the stimuli in his environment, for he will be capable of reorganizing, elaborating, and concretizing, relatively disorganized, unelaborated and abstract materials. (p. 26)

In order to be competent readers, students must be able to organize meaning units while reading (Laberge & Samuels, 1974; Smith & Hesse, 1969).

In the present study the graphic advance organizer was a visual representation of the text content. As students wrote on the organizer, they were guided through the text organization. Students were encouraged to process information in an organized scheme rather than learning content as a group of unrelated facts.

## Graphic Advance Organizers to Facilitate Delayed Comprehension

In the first section of the rationale two lines of research were cited to support the use of a graphic advance organizer before and during reading to facilitate immediate comprehension of written text.

The second section offers justification for the use of the graphic advance organizer after reading to facilitate delayed comprehension.

Learning requires that students build upon existing knowledge; such construction can take place only if students remember previously learned facts which can serve as building blocks for further learning (Gagne, 1977, p. 196). Students need techniques that are designed to strengthen retention of content to help them remember facts. Such techniques could be used while learning to strengthen retention of the content and then could be employed periodically after learning to enhance memory.

Ausubel (1978, p. 174) claims that the advance organizer is a technique that not only facilitates learning but also strengthens retention of content. The organizer strengthens retention of content in two ways. First, the familiar terms in an advance organizer act as subsumers which take in the new knowledge and anchor the concepts to the learner's existing knowledge base. The stability given to the new information strengthens retention. Second, the organizer helps to differentiate between the newly acquired information and existing knowledge. The emphasis on the new information strengthens retention. Since the advance organizer strengthens retention of content while learning, the construct may be adaptable for periodic use after learning to enhance memory.

A graphic advance organizer is a semantic diagram made up of an arrangement of key terms and phrases that represent the major concepts in a text. Because the graphic advance organizer forms a visual

representation of the major concepts in a text, use of the organizer after reading may prove to be an effective technique for strengthening the retention of content. Two studies have been conducted with graphic advance organizers used after reading. Glynn and DiVesta (1977) found that students working with an organizer in outline format prior to taking a recall test performed significantly better than students not working with the organizer. Barron and Stone (1974) compared the effectiveness of a graphic advance organizer and a graphic post organizer in a study with tenth- and eleventh-grade students. The topic of the materials was mental health. Students were given a test after using the organizers and reading the text. Analysis of data indicated no difference between the two organizer groups and the control group. However, data indicated a significant difference between the two organizer groups favoring the post organizer group.

In the present study, the organizer was not only used before and during reading but it was also used after reading. Each student read through the materials at his own pace. One week after reading the text a student in the treatment group was given time to review the graphic advance organizer. A student in the control group was given the same amount of time to review the text. Reading over the text is a review technique commonly used for strengthening retention (Ausubel, 1978, pp. 318-319). After the review period, a student was given a comprehension test to determine the effects of the use of the organizer on delayed comprehension.

## Varying Levels of Reading Competency

The need to investigate whether reading competency is a factor in determining who benefits most from the use of a graphic advance organizer is reported in the third section of the rationale.

Findings from advance organizer research indicate that students' ability level and the difficulty of the task are two factors that determine who benefits from the use of advance organizers. Ausubel and Fitzgerald (1962) assert that the facilitating effect of an advance organizer on learning new materials seems to be limited to learners who have low-verbal ability. Schulz (1966) confirms this finding and adds low-analytic ability as another qualifier. Grotelueschen and Sjogren (1968) found that the difficulty of the learning task plays a major part in who benefits from the use of an advance organizer. They reported that the organizer benefited high-ability students as well as other students, when the learning task was particularly difficult.

Findings from graphic advance organizer studies have not supported the findings from the earlier advance organizer studies. Researchers have been unable to identify any factors that can be used to distinguish a particular group of learners for whom the graphic advance organizer has proven most useful (Barron, 1972; Estes, 1972; Barron & Cooper, 1973).

In an effort to determine if reading competency is a factor in determining who benefits most from the use of a graphic advance

organizer, subjects in the present study were stratified into groups of below-level readers, at-level readers, and above-level readers.

## Questions and Hypotheses

Based upon suggestions found in the literature, in studies of advance organizers and of graphic advance organizers, a graphic advance organizer was designed. The graphic advance organizer was used before, during, and after reading. The facilitative effects of the organizer on immediate and delayed comprehension were examined. Also whether a particular level of reader benefited more than another level from using the graphic advance organizer was investigated.

### Questions

Three questions were formulated to determine the usefulness of a graphic advance organizer.

1. Does the use of a graphic advance organizer with text facilitate immediate comprehension?
2. Does the use of a graphic advance organizer with text facilitate delayed comprehension?
3. Do students classified as below-level readers, at-level readers, and above-level readers benefit similarly from using a graphic advance organizer?

### Hypotheses

To facilitate answering the questions, six hypotheses were stated.

Where research evidence warranted, directional hypotheses were formulated.

Hypothesis 1: Students who use a graphic advance organizer while reading will score significantly higher on a composite-comprehension test measuring immediate comprehension of single-theme text than students who do not use the graphic advance organizer.

Hypothesis 2: Composite-comprehension scores will not reflect a significant interaction between the main effects of condition (treatment, control) and reading level (below level, at level, above level).

Hypothesis 3: Students who use a graphic advance organizer while reading will score significantly higher on a comprehensive-comprehension test measuring immediate comprehension of multi-thematic text than students who do not use the graphic advance organizer.

Hypothesis 4: Comprehensive-comprehension scores will not reflect a significant interaction between the main effects of condition (treatment, control) and reading level (below level, at level, above level).

Hypothesis 5: Students who use a graphic advance organizer before, during, and after reading will score significantly higher on a delayed-comprehension test than students who do not use the graphic advance organizer.

Hypothesis 6: Delayed-comprehension scores will not reflect a significant interaction between the main effects of condition (treatment, control) and reading level (below level, at level, above level).

# CHAPTER II

## METHOD

The purpose of the study was to investigate the effects of a graphic advance organizer used before, during, and after reading on sixth-grade students' comprehension of written text. The nature of the content and the readability of the expository materials used in the study are representative of materials students are expected to read in content-area textbooks. The study was conducted during the spring semester. Data were examined to determine whether the treatment group using the graphic advance organizer performed better than the control group on the composite-comprehension test, the comprehensive-comprehension test and the delayed-comprehension test.

### Subjects

The subjects in the study were sixth graders. The sixth-grade level was selected because (1) few advance organizer studies have been conducted with students of this age level; and (2) the investigator was familiar with the sixth-grade curriculum of the school system the students were in and was thus relatively assured that the content of the text used in the study would be unfamiliar to the students. The

students attended a middle school which serves the entire community in a city in western Wisconsin. The students are representative of a wide range of socio-economic backgrounds and academic ability.

The middle school has twelve sixth-grade classes with a total of 297 sixth graders. Students come to the school from five elementary schools in the community. When the sixth graders enroll in the middle school, the administrators selectively assign the students to twelve classes so that membership in the classes is a mixture of students from the five feeder schools. The administration does not foster ability grouping so classes are heterogeneous. Therefore, each sixth-grade class has students from various parts of the community who are working at varying ability levels.

From the 297 sixth graders, 197 students were selected to participate in the study. The 197 students were in eight of the twelve sixth grade classes. Selection of the subjects was based on which classes the participating teachers had access to. Each of the four teachers worked with two classes of sixth graders.

Due to absenteeism, lack of standardized scores, transfers to other schools and students' inability to cope with the materials, data were collected from 170 students. The treatment group and the control group had 85 students in each. For the statistical analysis of the data, the scores of 48 control group students and the scores of 48 treatment group students were randomly selected from the two respective experimental groups.

The results from the reading subtest of the Iowa Standardized Achievement Test given in the fall semester were used to stratify the subjects into below-level, at-level and above-level readers. Students whose scores on this test were in the 0-33rd percentile range were classified as below-level readers. Students whose scores were in the 34-66th percentile range were classified as at-level readers. Students whose scores were above the 66th percentile were classified as above-level readers. A frequency chart showing the distribution of the subjects' reading scores is located in Appendix A.

## Teachers

Four sixth-grade teachers from the middle school volunteered to assist in the study. Each teacher worked with two groups of students. One of each teacher's two groups was randomly assigned to the treatment condition and the other was assigned to the control condition.

## Materials

The instructional materials that were used in the study included four units on ecosystems, a graphic advance organizer, a slide-tape presentation on how to use a graphic advance organizer, and scripts providing verbatim instructions for teachers to give to the students.

The four units were bound into a booklet titled Life in Ecosystems. Unit One is entitled "Ecosystems" and is 1,985 words long; Unit Two,

"The Kalahari Desert," is 2,935 words long; Unit Three, "The Island of Java," is 3,401 words long; and Unit Four, "The City of New Orleans," is 3,734 words long. The booklet is a revision of the environmental reader developed and used by Wilkie (1978). The content of the reader deals with the interaction of people within their ecosystem. Each unit covers a specific ecosystem and discusses the climate, land-forms, plants, animals, and culture of that ecosystem. Using the Fry readability formula the materials were found to be at the 7.2 reading level. The use of materials at a 7.2 reading level with sixth graders can be justified by the fact that textbooks are frequently written at a more difficult reading level than the grade level in which they are used (Janz & Smith, 1972). Hence the reading level of the environmental materials reflects what students typically must face in their content-area classes.

The graphic advance organizer used in the study was developed by following the guidelines set by Barron (1972). According to these guidelines, first, key vocabulary terms were to be identified. This identification was made in this study by listing all the concepts presented in each unit and arranging them into a diagram of the content of each unit. From these four concept diagrams the major concepts common to all the units were identified. These major concepts represented what Barron refers to as the key vocabulary terms. These terms were then arranged into a schematic diagram to show their interrelationships. Lines and arrows were added to clarify the interrelationships. This diagram was the prototype of the graphic advance

organizer to be used in the study. Next, by using information from reference books in the environmental sciences (Odum, 1975; Sale, 1972; Smith, 1966), the experimenter modified the graphic advance organizer so that it related to the discipline of environmental ecology. Then the organizer was evaluated for clarity and appropriateness by two members of the Wisconsin Research and Development Center's reading staff who were in the process of editing the environmental reader. Throughout the experiment the graphic advance organizer was referred to as a "reading plan."

A ten minute slide-tape presentation (Appendix B) was used to explain why the graphic advance organizer is used and how it is used. The slide tape presentation was shown first to the teachers as part of the teacher-training session and then later shown to the treatment groups.

Two scripts (Appendix C) were given to the instructors. One script was to be used with the control group and contained an explanation of what the students were required to do. The other script was to be used with the treatment group and contained information that explained the graphic advance organizer (reading plan). This script included questions for teachers to ask in an attempt to guide students in discovering the major concepts on the graphic advance organizer (reading plan) and in understanding how the concepts were related. The students were guided in filling in several spaces on the organizer (reading plan) in order to practice using it.

Several tests (Appendix D) were used in the study as measures of comprehension. After a student completed each unit in the reader he was given a short multiple-choice subtest on the content. These subtests were scored as one test which was labelled the composite-comprehension test. A comprehensive-comprehension test that consisted of all the multiple-choice items from the subtests plus a selection of additional items was given as soon as a student completed reading all the materials. A delayed test made up of twenty short-answer questions on all the content was given one week after the comprehensive-comprehension test.

The composite-comprehension test was a collection of four short subtests, one taken after a student completed each unit of the materials. Items for the test were drawn from the fifty-item comprehensive-comprehension test which was developed by a team of workers on the reading staff of the Wisconsin Research and Development Center who had been working on the environmental reader (Otto & Associates, in press).

In the development of the comprehensive-comprehension test, the team first reviewed the objectives that had been written for the materials and also thoroughly reviewed the complete text. An initial set of items was developed. These items were then reviewed and revised until the team agreed on fifty items that they felt measured information a student should know after reading the materials.

The Hoyt internal-consistency reliability coefficient for the twenty-seven item immediate-comprehension test was .78. The Spearman

reliability coefficient for the fifty-item test was .79. According to Mehrens and Lehmann (1973), a reliability coefficient of about .65 is sufficient for group decisions. Therefore, the reported coefficients are adequate.

The delayed-comprehension test which consisted of twenty short-answer questions was developed according to Bormuth's procedure on developing "wh" questions as presented in the Hansen and Hesse study (1974). Using the four concept diagrams which had been developed for the four units, the investigator wrote a set of sixty-four "wh" questions. From this list twenty questions were randomly selected for the test. Two staff members of the Wisconsin Research and Development Center who were familiar with the materials independently reviewed the test to assure that the questions tested information that the materials were designed to convey to the readers.

Cronbach's alpha (Cronbach, 1951), an internal consistency reliability coefficient, was run on the results of the short-answer test. A .90 reliability coefficient resulted from the analysis.

The investigator scored the short-answer tests. To check on the accuracy of the scoring an inter-judge reliability was calculated. Two teachers were asked to score 33 percent of the tests. Their results and the investigator's results were processed for inter-judge reliability. The three sets of scores resulted in .92 agreement. The procedure used for scoring the short answer test may be found in Appendix E.

## Procedure

A teacher-training session was held for all four teachers. The session consisted of three parts. In the first part, the teachers listened to a general overview of the study. In the second part, the teachers participated in a simulation of the student-training sessions so that they would know how to conduct these sessions with their students. The investigator played the role of an instructor and the four teachers were the students. Emphasis was placed on how to use the scripts. During part three, teachers were told how to monitor the student instructional sessions. During the instructional sessions, students would be reading the materials on their own.

Student-training sessions were conducted by the teachers. The teachers acquainted the students with the materials and tasks. The control-group training sessions consisted of a teacher reading a scripted introduction explaining the materials and telling the students what they would be expected to do. The instructor then called on volunteers to read Unit One aloud. Unit One is an introduction to the materials and was used only by the control group. The treatment group training session consisted of a ten minute slide-tape presentation on how to use the graphic advance organizer (reading plan). The presentation was shown to all the treatment classes at the same time in the school auditorium. The teachers, at their next meeting with their classes, read through the scripted introduction and got their students involved in using the graphic advance organizer (reading plan). Both the control classes and the treatment classes received a

short multiple-choice test covering the content presented in the introductions immediately after the training sessions.

Instructional sessions followed the student-training sessions. The instructional sessions were forty minutes long. During the instructional sessions the students read through the materials at their own pace. Students in both conditions were encouraged to use as much time as they felt was necessary to effectively read the materials. Students in the control classes spent from two through five instructional sessions reading the materials. The time spent by students in the treatment classes ranged from three to eight sessions. During the instructional sessions the teachers could not guide the students in using the materials. The only help they could offer was to assist a student in reading a word he could not pronounce or to encourage a student to reread a section if he did not understand it. This help was available to both treatment and control students but was given only when a student requested assistance.

After a student completed each of the three units, he took a short multiple-choice subtest. The subtests were from five to nine items in length. These three subtests plus the one given after the training session were eventually combined and scored to yield a composite-comprehension test score for each subject. After completing all the units each student took a fifty-item comprehensive-comprehension test. One week after each student took the comprehensive-comprehension test, he was given ten minutes to either review all four units if he was a control-group subject or the graphic advance organizer if he was a

treatment-group subject. After the review, he was given a twenty-item short-answer test. Table 1 provides a summary of the entire procedure.

## Design and Data Analysis

The design of the study was a posttest-only control group design (Campbell & Stanley, 1963). Three comprehension posttests were employed. Two hypotheses were stated with each comprehension test. To test each pair of hypotheses (1 and 2; 3 and 4; 5 and 6), a 2 x 3 analysis of variance was employed. The independent variables were condition (control, treatment) and reading competency (below level, at level, above level). The level of significance for testing the differences was set at $p < .05$. In order to have enough power to detect differences, sixteen scores were used in each of the six cells in the three analyses.

To select the sixteen scores for each cell, first all three posttests from each subject were placed into a folder. The 85 folders from the four treatment classes were pooled and then placed into three groups: the folders of the above-level readers (N = 30), the folders of the at-level readers (N = 25), and the folders of the below-level readers (N = 30). Sixteen folders were randomly selected from each group. The tests were then scored by the investigator. The scores from these tests were used for data analysis. The same procedure was used with the 85 folders from the control classes. Sixteen folders were randomly sampled from the 26 above-level readers, 29 at-level readers, and 30 below-level readers in the control group.

TABLE 1

PROCEDURE FOR THE CONTROL AND TREATMENT GROUPS

| | Control | Treatment |
|---|---|---|
| TEACHER-TRAINING SESSION | Part I - The investigator gave an overview of the study.<br>Part II - The four teachers took part in a simulation on conducting the student-training sessions.<br>Part III - Teachers were told how to monitor the instructional sessions when the students would be reading the materials. | |
| STUDENT-TRAINING SESSIONS | Each teacher worked with a control group and a treatment group.<br>The instructor read the script to acquaint the students with the materials. The instructor called on volunteers to orally read the first unit of materials. When completed, students were given a short multiple-choice test on the content of the first unit. They were then told to carefully read the next three units.<br>Materials: Unit 1-Ecosystems, script, subtest | Part I - A ten minute slide-tape presentation was used to present the organizer. Objective: To explain to the students what the organizer is, why it is used, and how it is used.<br>Part II - The instructor, using a script, guided the students in filling in part of the reading plan. Scripted questions were used to get the students actively involved. Students were then given a short multiple-choice test on the concepts that had been presented. (Same test as the control group was given.)<br>Materials: Slide-tape presentation, graphic advance organizers (reading plans), script, subtest |
| INSTRUCTIONAL SESSIONS | Each student read the materials at his own rate. The instructor was present to assist with difficulties and to provide verbal encouragement. When a student completed each unit he was given a short content test.<br>Materials: Unit II-Kalahari, Unit III-Java, Unit IV-New Orleans, subtests | Each student read through the materials at his own rate. While he read, he filled in the reading plan with facts that developed the major concepts located on the reading plan. The instructor was present to assist with difficulties and to provide verbal encouragement. Instructors did not provide students with answers to write on the organizer.<br>Materials: Reading Plans, Unit II-Kalahari, Unit III-Java, Unit IV-New Orleans, subtests |
| COMPOSITE-COMPREHENSION TEST | The four short tests, one taken after each unit was completed, were stapled together. The results from these four tests were pooled to form the Composite-Comprehension Test score. | |
| COMPREHENSIVE-COMPREHENSION TEST | After completing all four units each student took a fifty-item multiple-choice test which covered all the content. | |
| DELAYED COMPREHENSION TEST | One week after taking the fifty-item test, a student was given ten minutes to review the ecosystem booklet and then took a twenty-item short-answer test. | One week after taking the fifty-item test, a student was given ten minutes to review the graphic advance organizer and then took a twenty-item short-answer test |

# CHAPTER III

## RESULTS AND DISCUSSION

The purpose of the study was to test the effects of using a graphic advance organizer before, during and after reading on the comprehension of written text. Three research questions were posed regarding the usefulness of a graphic advance organizer. The first question was: Does the use of a graphic advance organizer with text facilitate immediate comprehension? Two measures were used in seeking an answer to this question. The first measure was a set of four subtests. A subtest was given after each of the four units of the text was completed. Each subtest was directed at the content of one unit. Upon completion of all four subtests, the tests were scored to yield a composite-comprehension test score. The second measure was a comprehensive-comprehension test covering the content of all four units. This test was given after all the units had been completed.

The second question was: Does the use of a graphic advance organizer facilitate delayed comprehension? One week after a student took the comprehensive-comprehension test he was given ten minutes to review either the graphic advance organizer if he was a subject in the graphic advance organizer group or the text if he was in the reading-only group. After the review he was given a short-answer

comprehension test. Results from this test were used to answer the question.

The third question was: Do students classified as below-level, at-level, and above level readers benefit similarly from using a graphic advance organizer? Scores from the three comprehension tests were analyzed for an interaction of the two main effects: condition (treatment, control) and reading level (below level, at level, above level).

Six hypotheses were developed and tested to answer the three questions. Hypotheses 1 and 3, which were tested for the effect the organizer had on immediate comprehension, were related to the first question. Hypothesis 5, which was tested for the effect the organizer had on delayed comprehension, was related to the second question. And hypotheses 2, 4, and 6, which were tested for an interaction of condition and reading level, were related to the third question.

The statistical procedure used to test the hypotheses was analysis of variance. Since three comprehension tests were used, three separate analyses of variance were performed. To present the results of the analyses, each hypothesis is stated and a discussion of the results follows.

## Hypothesis 1

The first hypothesis is a prediction that the students in the graphic advance organizer group would outperform the students in the

reading-only control group on the four comprehension subtests. The tests were pooled and scored to yield the composite-comprehension test score.

(1) Students who use a graphic advance organizer while reading will score significantly higher on a composite-comprehension test measuring immediate comprehension of single-theme text than students who do not use the graphic advance organizer.

The mean scores and the standard deviations from the composite-comprehension test for the graphic advance organizer group and the reading-only control group are shown in Table 2. Analysis of variance was used to examine the effects of the two major experimental variables, condition (treatment, control) and reading level (below level, at level, above level). The results of the analysis are reported in Table 3.

Results of analysis of variance of the composite comprehension test scores indicate that the mean of the graphic advance organizer group was not significantly different from the mean of the reading-only control group ($f = .682$, $df = 1/90$, $p \leq .411$).

Based on the absence of a significant difference, Hypothesis 1 is not accepted. Use of the graphic advance organizer during reading did not improve the comprehension of the written text. This finding is consistent with those of Barron (1972), Estes (1972), and Barron and Cooper (1973) who found no support for the use of a graphic advance organizer to improve comprehension.

Two possible explanations for the non-significant results are drawn from previous research. Rickards (1976) reported that students

TABLE 2

COMPOSITE-COMPREHENSION TEST*
MEAN SCORES AND STANDARD DEVIATIONS

| | | Below-level Readers (N=16) | At-level Readers (N=16) | Above-level Readers (N=16) | All Readers (N=48) |
|---|---|---|---|---|---|
| Graphic Advance Organizer Group | $\bar{X}$ | 13.87 | 16.06 | 20.44 | 16.79 |
| | SD | 3.20 | 4.28 | 2.80 | 4.39 |
| Reading-Only Control Group | $\bar{X}$ | 11.69 | 16.12 | 20.69 | 16.17 |
| | SD | 3.20 | 3.76 | 4.66 | 5.34 |

*Possible score of 27 points.

TABLE 3

SUMMARY OF ANALYSIS OF VARIANCE OF STUDENTS'
COMPOSITE-COMPREHENSION TEST SCORES

| SOURCE | df | MS | F | P |
|---|---|---|---|---|
| Condition | 1 | 9.375 | .682 | .411 |
| Reading Level | 2 | 487.948 | 35.494 | <.001 |
| Condition X Reading Level | 2 | 14.719 | 1.071 | .347 |
| Error | 90 | 13.747 | | |

may not have difficulty understanding the content of a passage that is written about one major theme, so supplying the readers with an organizer may be immaterial to the subsumptive process. Results of the present study indicate that students may not have needed an organizer to assist them in comprehending the single-theme units. Each unit was written on one type of ecosystem with a discussion of all the major features of that ecosystem. Another explanation is related to the test that was used. Mayer (1979) found that advance organizers can lead to an increase in conceptual retention but not in retention of specific technical details. In the present study the items for the composite-comprehension test were drawn from the comprehensive-comprehension test. Many of the items that formed the composite-comprehension test measured knowledge of specific details and did not focus on the broader concepts. According to Mayer's findings advance organizers do not aid in retention of the kind of information that the composite-comprehension test was measuring.

The lack of a significant difference between the treatment group and the control group found in the testing of Hypothesis 1 can be used to begin to answer the first question: Does the use of a graphic advance organizer with text facilitate immediate comprehension? The results indicate that the use of a graphic advance organizer with a single-theme text does not improve comprehension when comprehension is measured immediately after reading and is measured by a multiple-choice test.

In the analysis of variance of the composite-comprehension test

scores the second main effect was reading level. Although this main effect, by itself, was not of major interest in this investigation, the significant difference ($F = 35.494$, $df = 2$, $p < .05$) warrants an explanation. From an inspection of the scores (Table 2) one can see that the higher the reading-competency level the higher the score on the reading test. The significant difference is a result of reading competency. The more capable the reader, the better he will do on the reading test.

## Hypothesis 2

The second hypothesis deals with the interaction of reading level and the two experimental conditions as measured by the composite-comprehension test.

(2) Composite-comprehension scores will not reflect a significant interaction between the main effects of condition (treatment, control) and reading level (below level, at level, above level).

Results of analysis of variance of the immediate-comprehension test scores (Table 3) indicate no significant interaction of reading level and condition ($F = 1.071$, $df = 2/90$, $p \leq .347$).

Based on the lack of a significant interaction, Hypothesis 2 is not rejected. This result is consistent with Estes' (1972) findings. In his graphic advance organizer study with students in grades eight through twelve, he found no statistical significance at any reading-competency level.

The results from the testing of Hypothesis 2 can be used to begin to answer the third question: Do students classified as below-level, at-level, and above-level readers benefit similarly from using a graphic advance organizer? The results show that the students categorized in the three reading levels did benefit similarly from the use of the graphic advance organizer.

## Hypothesis 3

The third hypothesis is a prediction that the graphic advance organizer group would outperform the reading-only control group on the comprehensive-comprehension test which was given immediately after a student had completed reading all four units.

(3) Students who use a graphic advance organizer while reading will score significantly higher on a comprehensive-comprehension test measuring immediate comprehension of multi-thematic text than students who do not use the graphic advance organizer.

The mean scores and the standard deviations from the comprehensive-comprehension test for the graphic advance organizer group and the reading-only control group are shown in Table 4. Analysis of variance was used to examine the effects of the two major experimental variables, condition (treatment, control) and reading level (below level, at level, above level). The results of the analysis are reported in Table 5.

Results of analysis of variance of the comprehensive-comprehension test scores indicate that the mean of the graphic advance organizer

TABLE 4

COMPREHENSIVE-COMPREHENSION TEST*
MEAN SCORES AND STANDARD DEVIATIONS

| | | Below-level Readers (N=16) | At-level Readers (N=16) | Above-level Readers (N=16) | All Readers (N=48) |
|---|---|---|---|---|---|
| Graphic Advance Organizer Group | $\bar{X}$ | 22.81 | 26.94 | 38.81 | 29.52 |
| | SD | 7.44 | 8.44 | 3.51 | 9.56 |
| Reading-Only Control Group | $\bar{X}$ | 16.75 | 26.31 | 36.56 | 26.54 |
| | SD | 5.00 | 8.11 | 8.41 | 10.88 |

*Possible score of 50 points.

TABLE 5

SUMMARY OF ANALYSIS OF VARIANCE OF STUDENTS'
COMPREHENSIVE-COMPREHENSION TEST SCORES

| SOURCE | df | MS | F | P |
|---|---|---|---|---|
| Condition | 1 | 213.010 | 4.252 | <.042 |
| Reading Level | 2 | 2612.531 | 52.156 | <.001 |
| Condition X Reading Level | 2 | 62.323 | 1.244 | .293 |
| Error | 90 | 50.091 | | |

group was significantly different from the mean of the reading-only group ($F = 4.252$, $df = 1/90$, $p < .05$).

Based on the presence of a significant difference, Hypothesis 3 is accepted. Use of the graphic advance organizer during reading improved the comprehension of the written text as measured by a test that covered the content of all the units. This finding is in harmony with the results of studies by Estes, Mills and Barron (1969), Earle (1969, 1970), and Barron (1971).

The two explanations that were given for the non-significant results from the analysis of the composite-comprehension test scores provide support for the fact that a significant difference resulted from the analysis of the scores of the comprehensive-comprehension test. First, testing after each unit, as was done with the composite-comprehension test, represented testing one major topic at a time. However, testing after all the units represented a multi-thematic evaluation and the resulting significant findings correspond to those of Rickards (1976). Second, the comprehensive-comprehension test was made up of all the composite-comprehension test items plus an additional twenty-three items that focused on major concepts common to all the units. These additional items which emphasized broader concepts could have been a factor that contributed to the significant results. These findings are consistent with those of Mayer (1979).

The significant difference found between the treatment group and the control group in the testing of Hypothesis 3 can be used to complete the answer to the first question: Does the use of a graphic

advance organizer with text facilitate immediate comprehension? The results show that the graphic advance organizer does facilitate comprehension of multi-thematic text. The organizer apparently helps to keep the information under each topic organized so that the student can recall the information when tested. The test to measure comprehension is a multiple-choice test given immediately after reading the text.

As was the case in the analysis of the composite-comprehension test scores, the comprehensive-comprehension test score analysis resulted in a significant difference for the main effect of reading level ($F = 52.156$, $df = 2/90$, $p < .05$). Once again the results show that the higher the competency level of a reader, the better he performs on a comprehension test.

## Hypothesis 4

The fourth hypothesis deals with the interaction of the two experimental conditions and reading level as measured by the comprehensive-comprehension test.

(4) Comprehensive-comprehension scores will not reflect a significant interaction between the main effects of condition (treatment, control) and reading level (below level, at level, above level).

Results of analysis of variance of the comprehensive-comprehension test scores (Table 5) indicate no significant interaction of condition and reading level ($F = 1.244$, $df = 2/90$, $p \leq .293$).

Although there was no significant interaction, inspection of the mean scores (Table 4) indicates that there was very little improvement in comprehension by the at-level readers in the graphic advance organizer group in comparison to their counterparts in the control group. The below-level and above-level readers appear to have benefited more than the at-level readers from the use of the organizer, but the difference in improvement was not enough to show a significant interaction. Due to the lack of a significant interaction, Hypothesis 4 is not rejected. It must, therefore, be concluded that students of varying reading levels benefited similarly from the use of the graphic advance organizer.

This finding contributes to the answer for the third question, whether students of varying reading competency levels benefit similarly from using a graphic advance organizer. As found from the testing of both Hypotheses 2 and 4, the students benefit similarly.

## Hypothesis 5

The fifth hypothesis is a prediction that on a delayed-comprehension test the students in the graphic advance organizer group who had used the organizer before, during, and after reading would outperform the students in the reading-only control group who had not used an organizer.

(5) Students who use a graphic advance organizer before, during, and after reading will score significantly higher on a delayed-comprehension test than students who do not use the graphic advance organizer.

The mean scores and the standard deviations from the delayed-comprehension test for the graphic advance organizer group and the reading-only control group are shown in Table 6. Analysis of variance was used to examine the effects of the two major experimental variables, condition (treatment, control) and reading level (below level, at level, above level). The results of the analysis are reported in Table 7.

Results of analysis of variance of the delayed-comprehension test scores indicate that the mean of the treatment group was significantly different from the mean of the control group ($F = 16.731$, $df = 1/90$, $p < .05$).

Based on the presence of the significant difference, Hypothesis 5 is accepted. Use of the graphic advance organizer facilitates delayed comprehension. This finding is consistent with those of Earle (1969, 1970) who found that the graphic advance organizer positively affected delayed retention and with that of Glynn and DiVesta (1977) who used an organizer after reading and found that it facilitated retention of the text content.

The presence of a significant difference between the treatment group and the control group found in testing Hypothesis 5 is the basis for answering the second question: Does the use of a graphic advance organizer facilitate delayed comprehension? The findings indicate that the use of the graphic advance organizer facilitates delayed comprehension. A short-answer test was used to measure delayed comprehension.

TABLE 6

DELAYED-COMPREHENSION TEST*
MEAN SCORES AND STANDARD DEVIATIONS

| | | Below-level Readers (N=16) | At-level Readers (N=16) | Above-level Readers (N=16) | All Readers (N=48) |
|---|---|---|---|---|---|
| Graphic Advance Organizer Group | $\bar{X}$ | 12.94 | 16.94 | 25.25 | 18.37 |
| | SD | 6.48 | 6.01 | 4.61 | 7.65 |
| Reading-Only Control Group | $\bar{X}$ | 8.06 | 13.19 | 20.44 | 13.90 |
| | SD | 4.30 | 5.95 | 4.43 | 7.05 |

*Possible score of 40 points.

TABLE 7

SUMMARY OF ANALYSIS OF VARIANCE OF STUDENTS' DELAYED-COMPREHENSION TEST SCORES

| SOURCE | df | MS | F | P |
|---|---|---|---|---|
| Condition | 1 | 481.510 | 16.731 | <.001 |
| Reading Level | 2 | 1246.573 | 43.314 | <.001 |
| Condition X Reading Level | 2 | 3.198 | .111 | .895 |
| Error | 90 | 28.780 | | |

As in the two previous analyses, a significant difference was once again revealed in the performance of the three reading levels ($F = 43.314$, $df = 2/90$, $p < .05$). The effects of this variable although not of major interest in this study have consistently shown that reading competency plays an important part in how well a student performed on a comprehension test.

## Hypothesis 6

The sixth hypothesis deals with the interaction of the two experimental conditions and reading level as measured by the delayed-comprehension test.

(6) Delayed-comprehension scores will not reflect a significant interaction between the main effects of condition (treatment, control) and reading level (below level, at level, above level).

Results of analysis of variance of the delayed-comprehension test scores (Table 7) indicate no significant interaction of condition and reading level ($F = .111$, $df = 2/90$, $p < .895$).

Based on the lack of a significant interaction, Hypothesis 6 is not rejected. All levels benefited similarly from using the graphic advance organizer. This finding completes the answer to the third question: Do students classified as below-level, at-level, and above-level readers benefit similarly from using a graphic advance organizer?

## Summary of Results

Six hypotheses were generated in order to answer three questions that were posed in the study. The first question deals with the facilitative value of a graphic advance organizer on immediate comprehension of written text. Results from the testing of Hypothesis 1 indicate that when a comprehension test covered only one unit the graphic advance organizer did not facilitate comprehension. However, as the results from the testing of Hypothesis 3 indicate, when the comprehension test covered all the units the graphic advance organizer facilitated comprehension. Therefore, the graphic advance organizer facilitates immediate comprehension of multi-theme text. The testing of Hypothesis 5 resulted in a finding that indicates the effectiveness of the graphic advance organizer in facilitating delayed comprehension of text. This finding answers the second question on the effects of the graphic advance organizer on delayed comprehension. Students' retention is improved by the use of the graphic advance organizer before, during, and after reading. The third question, on identifying a reading level that appears to benefit most from the use of a graphic advance organizer, is answered by the fact that all levels benefited similarly from the use of the graphic advance organizer. This answer is supplied by the testing of Hypotheses 2, 4, and 6 which involved testing for an interaction between the two main effects of condition and reading level.

# CHAPTER IV

## SUMMARY, CONCLUSIONS, IMPLICATIONS, AND LIMITATIONS

The purpose of this study was to test the effects of a graphic advance organizer used before, during, and after reading on the comprehension of written text. A graphic advance organizer is an adjunct aid that is used to focus the reader's attention on important content. The graphic advance organizer used in the present study was constructed by identifying key vocabulary terms and key phrases to represent the main ideas in the text and then arranging these terms and phrases into a diagram of the content organization. Before reading, the students were given a presentation that explained the graphic advance organizer: what it is, why it is used, and how it is used. During reading, the students were required to fill in the organizer with facts that developed the main ideas. After reading, the students reviewed the graphic advance organizer to strengthen retention of content. In the directions to the students the term "reading plan" was used rather than "graphic advance organizer."

The rationale for using the graphic advance organizer to facilitate comprehension was based on two lines of research. The first line of research indicates that, when advance organizers are used in appropriate situations and are adequately evaluated, they influence the

outcome of learning (Mayer, 1979; Lawton & Wanska, 1977; Faw & Waller, 1976; Ausubel, 1978). The major problem found by critics of the advance organizer construct is that an adequate operational definition was never formulated (Hartley & Davis, 1976; Barnes & Clawson, 1975; Blanton & Tuinman, 1973; Barron, 1972). Addressing this problem, the graphic advance organizer was selected for use in the present study because it is a special form of advance organizer that has been operationally defined (see Barron, 1972). The second line of research used to support the value of the graphic advance organizer in facilitating comprehension is research stressing the importance of organizing content while reading (Smirnov, 1973). The graphic advance organizer, as an arrangement of key words and phrases, offers students a schematic diagram of the content organization. While students fill in the organizer, they are guided through the content and its organization.

The present study departed from previous graphic advance organizer research in that the students used the organizer not only before reading but also during and after reading. Research by Rickards (1976), in which he interspersed organizers in text, was used to support using the graphic advance organizer during reading. Research by Glynn and DiVesta (1977), in which they used an organizer after reading, was used to support using the graphic advance organizer after reading.

In addition to determining if the graphic advance organizer would facilitate comprehension when used before, during, and after reading, the researcher also wanted to determine whether students who

are below-level readers, at-level readers and above-level readers benefit similarly from using the adjunct aid. Graphic advance organizer research (Barron, 1972; Estes, 1972; Barron & Cooper, 1973) has not identified a particular group of learners for whom the organizer has proven most useful.

To determine the facilitative effects of the graphic advance organizer three questions were asked: (1) Does the use of a graphic advance organizer with text facilitate immediate comprehension? (2) Does the use of a graphic advance organizer with text facilitate delayed comprehension? (3) Do students classified as below-level, at-level, and above-level readers benefit similarly from using a graphic advance organizer with text?

To answer these questions data were collected from 170 sixth-grade students. Using the results of the Iowa Standardized Achievement Test obtained from school records, the students were stratified into below-level, at-level, and above-level readers. Four sixth-grade teachers worked with two classes each. One class was given the treatment condition and the other the control condition. In the control condition volunteers were called upon to read orally an introduction to the text. Students then read through the rest of the text at their own pace. Students in the treatment condition were given a presentation on the effective use of the graphic advance organizer (reading plan) and then read through the text at their own pace. While the students read, they filled in the organizer with facts that developed the main ideas. The students were directed to the main ideas by the key terms and phrases that served as headings on the organizer.

The text the students read was divided into four units. After every unit, each student was given a short comprehension test. Each test covered only the content of a single unit. These subtests were combined and scored to yield the composite-comprehension test score. When all the units were completed each student took a comprehensive-comprehension test which covered the content of all the units. One week after taking the comprehensive-comprehension test each student was given a ten-minute review period. A treatment-group student reviewed the graphic advance organizer; a control-group student reviewed the text. After the review period each subject was given a delayed-comprehension test.

The scores from the three tests (composite, comprehensive, delayed) were used to test for significant differences between the performance of the treatment group and the control group. Three analyses of variance were performed. The analysis of variance of the composite-comprehension test scores revealed no significant difference. A significant difference, however, was revealed by the analysis of variance of the comprehensive-comprehension test scores. These two sets of findings were used to answer the first question on the facilitative value of the graphic advance organizer on comprehension of written text. The findings indicate that although the graphic advance organizer did not facilitate comprehension of text that is written on a single theme, it did facilitate comprehension of multi-thematic text.

The analysis of variance of the delayed-comprehension test scores

revealed a significant difference favoring the performance of the treatment group. This finding was used to answer the question on the facilitative value of the graphic advance organizer to strengthen retention of content. The findings indicate that the use of the organizer did strengthen retention.

Results of the three analyses of variance indicated no interaction of condition (graphic advance organizer, reading only) and reading level (below level, at level, above level). Since no interaction resulted, the answer to the third question on whether students classified as below-level, at-level, and above-level readers benefit similarly from using a graphic advance organizer with text was that the students of all three reading levels benefited similarly.

## Limitations

The following limitations should be noted when interpreting the results of this study.

Generalizability of the results is limited to the type of materials used in the study, the grade level of students who participated, and the type of measurements used to assess literal comprehension. The text was expository material at the 7.2 readability level similar in nature to the content that is found in science and social studies textbooks. The students who participated were sixth graders representing a wide range of ability levels and economic backgrounds. Literal comprehension of text was measured by multiple-choice tests

which were used for the immediate and the comprehensive tests and a short-answer test which was used for the delayed-comprehension measure.

A limitation in random sampling took place in the selection of the 197 students from the 297 sixth-grade population. So as not to interfere with the complex middle-school scheduling, students whose schedules were compatible with the schedules of the four participating teachers were selected. Care had to be taken so that a student in one teacher's group would not also be involved in another participating teacher's groups.

The present investigation was a student-paced study. Students in both the treatment group and the control group were allowed to spend as much time as they desired to read the materials. Students in the treatment group, as a whole, spent more time working with the materials than did the control-group students. Because of the increased amount of time spent by the treatment group, this variable is listed as a limitation in the procedure.

Teacher involvement in the study limited the control of the instructions given to the students. The fact that four teachers participated means that the students did not receive identical instructions. Although scripts were used to control the content of the instructions, the presentation of the instruction could not be controlled.

Two limitations are noted in the tests used in the study. The short-answer test for delayed comprehension must be acknowledged as a limitation in that the test could not be scored as objectively as

a multiple-choice test. Another limitation is that all the comprehension tests were difficult. Inspection of the mean scores (Tables 2, 4, 6) shows that the over-all performance on the comprehension tests was poor for all the readers. The tests may have been too difficult and may not have given an accurate measure of the treatment effect.

## Conclusions

The first conclusion that may be drawn from the findings of this study is that the graphic advance organizer does not facilitate immediate comprehension of single-theme text as measured by a multiple-choice test administered immediately after reading, but it does facilitate immediate comprehension of multi-thematic text. Students reading a text written on one major theme do not appear to have difficulty organizing and retaining the facts. A graphic advance organizer does not help them understand the content. However, when the text is on several major themes and each theme has its own set of facts that the students must keep organized, then the organizer becomes helpful in understanding the text. The graphic advance organizer serves as a blueprint to help students see how the facts can be organized so that they can be more readily understood and retained.

Another conclusion drawn from the findings is that the graphic advance organizer as used in the present study facilitates delayed comprehension. One week after reading the text, students using the organizer before, during, and after reading scored higher on a short-answer test which covered the content of all the units in the text.

The final conclusion that the findings of the study suggest is that below-level, at-level, and above-level readers benefit similarly from the use of the graphic advance organizer.

## Implications

Based on the conclusions and limitations of the study, several implications are suggested. The implications are divided into implications for the classroom teacher and suggestions for further research.

### Implications for the Classroom Teacher

Teachers could construct reading plans (graphic advance organizers) for sections in their science and social studies textbooks so that the attention of the students would be focused on the important concepts in the text. Once a teacher has identified a section in a text that covers several major themes, he could begin constructing a reading plan. The instructor would first identify the main ideas in the text and represent these ideas with key vocabulary terms or short phrases. These terms and phrases would serve as headings and would be arranged into a diagram of the text. Arrows and lines on the diagram would be used to show how the ideas are related. Enough space would be provided with each heading so that while the student is reading he could jot down the facts that support the main ideas. The instructor would check over the reading plan (graphic advance organizer) and add any additional headings that might help the students understand the content. Other instructors would be asked to check over the reading

plan and make suggestions for improvement. The reading plan would be reproduced for all the students. The instructor would explain the reading plan to the students, telling them what it is, why it is used, and how it is used. Students would now begin reading the text and filling in the organizer with supporting details from the text. Through this activity they would be guided through the content and provided with an organization of the content.

After using the reading plan to guide the students through a section of a textbook, the instructor could use the plan as a review for that section. By being provided with effective ongoing reviews in a course of study, students may be assisted in developing a knowledge base in a subject area rather than learning the content in one section of a textbook and forgetting the information when a new section is introduced.

Students could use the reading plan to study for a test. Not all students take notes while they read, so to study for a test students must rely on going back over the entire text or on using study sheets the teacher provides. The reading plan could serve as a guide that students complete during reading and later use to study for a test.

Remedial reading teachers could develop reading plans for their students who are having difficulties in content area classes. The reading plans could be used to help the students cope with difficult textbooks.

In addition to teachers using reading plans to facilitate comprehension of text, they would use the plans as a readability

check. Students are often confronted with textbooks that are too difficult for them to understand. Simply watching a group of students engaged in reading from their books does not always signal which students are having problems. If students were working on reading plans, the instructor could walk around the class and check the plans. If he finds a student having difficulties with a plan, he could ask the student questions on the content to see if the text is too difficult. After the instructor has identified the students having difficulties, he could select a text at a lower readability level or could give the students a more focused adjunct aid such as adjacent-to-text activities (Wilkie, 1978). With adjacent-to-text activities students are directed to specific places in the text where they should focus attention. A worksheet which is lined up with the margin of a page in the text has markers which point directly to the lines in the text that merit special attention. An activity inviting the student to think through the content accompanies the markers.

## Suggestions for Further Research

Based on the conclusions and the limitations of the study several implications for further research are suggested.

The present study was conducted with expository text. Research could be conducted to determine if the graphic advance organizer would facilitate comprehension of narrative text. Other studies could focus on how text variables (readability level, passage length, concept complexity, concept load) affect the facilitative value of a graphic advance organizer. By investigating text variables, researchers could

identify the type of text best suited for use with organizers. Such findings would be valuable for further organizer research and for classroom application.

Research is often conducted with text written specifically for use in a study. Studies should be conducted with text that comes directly from widely used textbooks. In the present study contrived text was used. Investigators could identify a textbook that has proven difficult for students and could test ways of employing a graphic advance organizer to facilitate learning from the textbook.

The present study was directed toward measuring the effects of a graphic advance organizer on literal comprehension. Other studies could be conducted with instruments measuring other levels of comprehension.

A possibility exists that the short multiple-choice subtests used for the immediate-comprehension test did not tap the information the treatment group learned. An investigation could be conducted in which a variety of test formats (recall, probed recall, recognition) is used to determine which format is the most effective for graphic advance organizer research.

In the present study the investigator speculates that the use of the organizer after reading was an important influence on the facilitation of delayed comprehension. Further research, however, would be necessary to clarify the specific effects the use of the organizer after reading has on retention of content. A study could be conducted with three groups of students. All three groups could use

the organizer before and during reading. But one group could use the organizer after reading, another could read over the text after reading, and the third could have no review. The investigator could then administer a comprehension test and test for differences. If the investigator had access to a large population, he could increase the number of groups and have varying periods of time before administering the delayed-comprehension test, ranging from a few days to several months.

Further research could determine at what age level students could effectively begin using a graphic advance organizer, and at what age the use of the organizer would be inefficient and should possibly be replaced by strategies such as note-taking, outlining, or rereading. A longitudinal study could be constructed in which several strategies are compared: graphic advance organizer, outlining, rereading. The purpose of such an investigation would be to determine if the graphic advance organizer maintains its value or is better eventually replaced by other strategies.

Rothkopf (1974) has responded to criticism regarding the increased amount of time spent by subjects using adjunct aids as opposed to the time spent by control-group subjects. He states that "the total time hypothesis does not have a very sound empirical footing in student-paced study situations" (p. 4). Since this variable has not been carefully examined in student-paced studies, a graphic advance organizer study could be conducted in which inspection time would be a dependent variable. The results of the study could then be discussed

in regard to the efficiency of the strategy and whether the improvement in comprehension warrants the increased time spent with the materials.

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# APPENDIX A

## FREQUENCY DISTRIBUTION OF SUBJECTS' READING SCORES FROM THE IOWA STANDARDIZED ACHIEVEMENT TEST

Subjects' Reading Scores from the
Iowa Standardized Achievement Test

| Percentiles | Treatment Subjects | | Control Subjects | |
|---|---|---|---|---|
| | f | cf | f | cf |
| 96-99 | 4 | 48 | 3 | 48 |
| 91-95 | 6 | 44 | 5 | 45 |
| 86-90 | 3 | 38 | 2 | 40 |
| 81-85 | 1 | 35 | 2 | 38 |
| 76-80 | 1 | 34 | 2 | 36 |
| 71-75 | 0 | 33 | 2 | 34 |
| 66-70 | 2 | 33 | 0 | 32 |
| 61-65 | 2 | 31 | 0 | 32 |
| 56-60 | 2 | 29 | 2 | 32 |
| 51-55 | 2 | 27 | 3 | 30 |
| 46-50 | 3 | 25 | 4 | 27 |
| 41-45 | 3 | 22 | 3 | 23 |
| 36-40 | 3 | 19 | 4 | 20 |
| 31-35 | 6 | 16 | 5 | 16 |
| 26-30 | 1 | 10 | 2 | 11 |
| 21-25 | 0 | 9 | 0 | 9 |
| 16-20 | 3 | 9 | 1 | 9 |
| 11-15 | 3 | 6 | 4 | 8 |
| 6-10 | 1 | 3 | 4 | 4 |
| 1- 5 | 2 | 2 | 0 | 0 |

# APPENDIX B

## SCRIPT FROM SLIDE PRESENTATION

Script from Slide Presentation

No matter how good a reader you are--you should try to become even better--so that you can learn as much as possible from the books, magazines, and newspapers that you read. When you read for enjoyment, to answer questions or to become more informed--the better you are at reading, the more you will get out of what you read.

Reading can unlock many new worlds and solve many mysteries.

Reading can be an important key to your future.

One way to become a better reader is to use a reading plan. A reading plan is a diagram of the materials you will read. It gives headings of important facts. You fill in the reading plan while you read to help you to learn the important facts--and to see how all the information fits together.

The authors of materials that you read have written down many ideas. When you read, you must try to see how all the pieces of information fit together. It's something like a puzzle. You read and get many pieces of information....

But you only get the full picture when you put all the pieces together.

A reading plan shows you what points are important--and how they fit together. While you read, you must fill in the reading plan and concentrate on the information. When you are writing on the plan be very careful and don't rush. Make sure that you are writing in the correct information so that you can remember the right facts.

The reading plan that you will be given is similar to this diagram. The topic of the reading materials is Ecosystems. Before getting your reading plan. I'd like to explain a little about ecosystems.

Plants, animals, people, geographical features and climate in an environment plus the ways all these things interact is called an ecosystem.

An ecosystem can be a single tree--where birds and insects live and find food and shelter. Or the entire Earth can be considered to be one huge ecosystem. In every ecosystem there are living things that find food in order to survive. This search for food--where one living thing eats another--is called a food chain. A green plant is always the first step in a food chain. Because plants produce their own food, they are called producers. Animals eat plants and other animals. People eat both plants and animals. People and animals are called consumers. When an animal dies in a forest its body becomes food for insects, bacteria, and mold. These decomposers break apart the animal body and leave behind pieces of the dead animal. This

dead matter goes into the soil and fertilizes it. Plants are able to grow better in the enriched soil.

There are thousands and thousands of food chains in all different parts of our world.

People are part of some food chains.

But are not found in all of them.

In some ecosystems--people have done very little to change their surroundings. They try to <u>fit into</u> their environment. They try to adapt.

In other ecosystems--people have made many changes to their surroundings to suit their needs.

Culture is the way a group of people lives. Culture includes <u>how</u> people get their food.

A group's culture determines <u>how</u> they dress.

All the things a group of people do--from how they get food, to how they dress, to how they celebrate, to how they build their homes--are part of their culture.

You will read about the people of cultures in three ecosystems. In the first unit on the Kalahari ecosystem--you will read about the people in a hunting and gathering culture.

The second unit--you will read about the people of an agricultural culture on the tropical island of Java.

In the third unit--you will read about the industrial culture of New Orleans--where people form an artificial environment called a city and use industry to provide them with money to buy their food.

As you read about the three ecosystems--you will read about the five parts of each--their plants, animals, people, climate, and geographical features and how these parts interact. While you read and locate this information stop and fill in your reading plan. Your plan on ecosystems looks just like this plan.

Use a pencil when you work on your reading plan--so that you can erase to make changes. Write small so that you can write in as much important information as you can.

While you read, think about how the facts are related. Try to understand why certain animals live in the desert and not in a city. Try to see why the weather of an ecosystem controls how people can get food and determines what clothes they wear.

*Put all your information into your plan. It is your puzzle to put together. When it is completed, you will have unlocked many mysteries about ecosystems. Later you can use your plan to review all the facts you learned.*

*Remember you must learn to read so you can read to learn.*

THE END

# APPENDIX C

## TEACHER SCRIPTS FOR CONTROL AND TREATMENT GROUPS

Teacher Script for the Control Group

SAY

Reading is very important. One of your major goals in school should be to become a better reader. The reason we do so much reading in school is so that you can learn new information from what you read. When you read you have to pay very close attention to what you are reading. You must concentrate on all the ideas that are presented.

If you start thinking about other things while you are reading such as what you are going to have for dinner, who's coming over after school or the secret your best friend just told you, then you won't be able to learn very much from what you are reading.

Today, you are going to be reading about people who live in different places in the world. We will read the first unit together, then you will read the other sections on your own.

While we read the first unit pay careful attention to how the words are read so that you can recognize the more difficult terms when you see them in the other units. When you read the other units, try hard to learn as much as you can about the places and people that are presented.

*After you finish each unit you will take a short quiz.*

*When you have completed a unit, come to the question station. Here you will be given a list of multiple-choice statements to complete. Make sure you do your best completing the statements so that I can see what facts you remembered from your reading.*

Pass out the materials.

SAY *Turn to page 1. Who would like to begin reading?*

(Have volunteers read unit one, Ecosystems, pages 1-6)
Give the short introduction quiz.

SAY *Now that we are done with unit one, carefully read the next three units. When you are done with each unit bring up your booklet and you will be given a list of statements to complete.*

Teacher Script for the Treatment Group

Pass out the reading plans

SAY *Put your name on your reading plan. Locate the term ecosystems on your reading plan. Each ecosystem that you will read about is made up of five parts. Can anyone remember any of the parts of an ecosystem?*

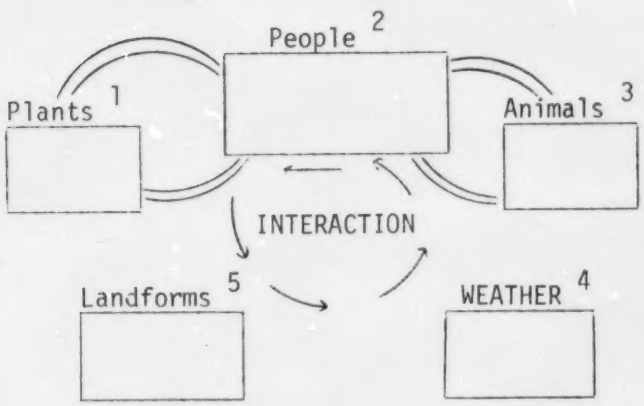
Transparency 1

(Call on volunteers. As the students give the responses, write them on the transparency. Add the ones they may have forgotten.)

SAY *Fill in your reading plan along with me.*

Five answers

1. Plants
2. People
3. Animals
4. Weather
5. Landforms




Transparency 1

SAY *All of the five parts can also be called an environment. But the word in the center of the reading plan makes the environment into an ecosystem. Can someone read the word in the center?*

---

Call on someone to read the word.
response-interaction

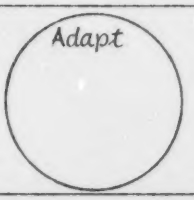
---

*When the living parts of the ecosystem (plants, people, and animals) and the non-living parts (weather and landforms) interact, we have an ecosystem. This means that the living parts do things so that they can live. They eat, make homes, people make clothes. Living things try to survive where they live.*

*In order to survive, the living things can either change their environment or simply try to live in it without making big changes. If the living things don't make a lot of changes in the environment and fit into the place where they live, we say they have adapted to the environment.*

*Find the circle that has the word adapt in it. Who can tell me what adapt means?*

Transparency 2



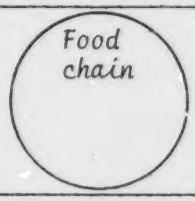

Student response should be similar to--
'to fit into the environment.'
Fill in a response on the transparency.

SAY *Notice that I am not simply filling in one word. The more information you can fill in the space, the more you will remember but make sure it is important information. Write small. Fill in the meaning for adapt.*

SAY *The living parts of the ecosystem--the plants, animals and people must eat in order to survive. Plants make their own food from the sun's energy. Plants are called producers because they produce their own food.*

*Animals and people are called consumers because they consume other living things in order to live. When an animal in a forest dies, its dead body becomes the food for insects, bacteria, and mold. These decomposers break the dead body apart. Some of the dead remains go into the soil and enrich it. The steps of living things eating and being eaten is called a food chain. There are thousands and thousands of food chains in the world.*

Transparency 3




SAY *Locate the circle on your reading plan that has the word food chain in it. Who can tell me what a food chain is?*

Response--steps of living things eating and being eaten in order to live.

Fill in a response on the transparency.

Transparency 1

SAY *Locate the food chain connecting the living parts of the ecosystem. Who can tell me the three different members of a food chain?*

Response--producer, consumer, decomposer

SAY *Who remembers what a producer is?*

Response--a plant.

Write it on the chart where it has "eg." next to producer.

SAY *Write the answers on your reading plan along with me.*

*Who can tell me what a consumer is?*

---

Response--animals or people.
Write it on the chart where it has "eg." next to consumer.

SAY *Who can tell me what a decomposer is?*

---

Response--insects, bacteria, mold.
Write the response on the chart where the empty "eg." space is located.

---

SAY *When you read the units you will read about three different ecosystems. Look at your reading plan and see if you can find the three places you will read about. Who can tell me the names of the three places?*

---

Response--Kalahari, Java, New Orleans.

---

SAY *When you read about each ecosystem you will read about the plants, people, animals, weather and landforms found there. The one part of the ecosystem you will read the most about is people. You will read about how people of each place get food, what they wear, what they live in, and how they celebrate. How people live, eat, play, dress and celebrate is called their culture. Locate the circle labelled*

*culture. Who can tell me what culture is?*

---

Transparency 4

1. Response--culture includes all the ways a group of people lives. How people eat, live, dress, play, etc., make up their culture.

   Fill in a response on the transparency.

2. Give short introduction quiz.
3. Pass out the booklets.

---

SAY *You will now begin reading on your own. The first unit you will read will be about the Kalahari Desert. While you read pay close attention to the information about the plants, animals, people, climate and geographical features. Try to see how the information is linked together. When you read about the climate of the Kalahari write in the information in the proper space on your reading plan. Locate that space right now. (Check) Write small when you fill in the space. As you read, if you want to change your answer, simply erase and write in the new information. Read carefully and do not rush through the materials. You are not being timed. After you finish each unit you will be given a short quiz. Come to the question station and you will be given a set of statements to complete.*

# APPENDIX D

## COMPREHENSION TESTS:
## COMPOSITE, COMPREHENSIVE, DELAYED

Composite-Comprehension Test

Name _____

Introduction

Date _____

1. The interaction among people, animals, plants, geographical features, and climate forms

   A. an ecosystem.
   B. a food chain.
   C. consumers and producers.
   D. an environment.

2. A food chain is best described as

   A. all the plants and animals in an ecosystem.
   B. a series of steps in which energy is passed by eating and being eaten.
   C. the animals in an ecosystem that eat other animals.
   D. the plants in an ecosystem that are eaten by animals.

3. Earthworms, bread molds, and termites are alike because they

   A. are all producers.
   B. are all predators.
   C. are all decomposers.
   D. have chlorophyll.

4. In a food chain a predator is a

   A. producer of chlorophyll.
   B. consumer of plants.
   C. decomposer of dead matter.
   D. consumer of animals.

5. The correct order for members of a food chain in a pond ecosystem is

   A. tadpole, algae, heron, fish.
   B. algae, tadpole, fish, heron.
   C. algae, fish, tadpole, heron.
   D. heron, algae, tadpole, fish.

The Kalahari Desert

Name _____

Date _____

1. The Bushmen believe the most worthwhile way to live is to

   A. raise animals.
   B. gather plants.
   C. gather nuts.
   D. hunt animals.

2. The name of a type of tree found in the Kalahari is

   A. werf.
   B. skerm.
   C. mongongo.
   D. baobob.

3. After an antelope is brought home, the Bushmen often

   A. rest for several days.
   B. move to a new territory.
   C. fight over who gets the meat.
   D. have a feast and dance.

4. In order to survive, the Bushmen

   A. grow plants that contain water.
   B. plant tsama melons and ga roots.
   C. herd antelope and ostriches.
   D. gather plants and hunt animals.

5. In the Bushmen story about the hunter and the moon, the sun is described as

   A. a friend of life.
   B. an enemy of life.
   C. an animal.
   D. a peacemaker.

6. The Bushmen live in bands that

A. wander only within a certain space or territory.
B. wander all over the Kalahari Desert.
C. wander outside the Kalahari during the dry season.
D. stay in one place and do not wander.

7. The Kalahari is in

A. northern Africa.
B. eastern Africa.
C. western Africa.
D. southern Africa.

8. The people of the Kalahari

A. have beliefs based on their hunting life.
B. do not have celebrations or feasts.
C. are not part of the food chains in the Kalahari.
D. worship the sun, the moon, the mantis, and the firebird.

9. The people of the Kalahari

A. sometimes live alone separate from the rest of the tribe.
B. live outside the Kalahari in the rainy season.
C. travel in bands and each band has its own territory.
D. occasionally war with each other to get new territory.

Java

Name _____

Date _____

1. An example of a Javanese tradition is

   A. a story about a mantis and a firebird.
   B. a parade through the village.
   C. a shadow play with puppets.
   D. choosing a king and queen for Mardi Gras.

2. Examples of plants that grow on the island of Java are

   A. mongongo nuts and tsama melons.
   B. wild pineapples and many flowers.
   C. cactus and baobobs.
   D. cypresses and Spanish moss.

3. Traditional farmers

   A. use machines to plow and dig irrigation ditches.
   B. use the kinds of tools and methods their grandparents did.
   C. seek new and better ways to farm.
   D. gather nuts and berries in a gotong-rojong spirit.

4. The mouse-deer, Pelanduk, in the Javanese story is like the people of Java because he

   A. likes to eat plums.
   B. uses his brain in order to survive.
   C. is a hunter and gatherer.
   D. believes in farming.

5. Rice is grown in

   A. levees.
   B. paddies.
   C. copra fields.
   D. irrigation ditches.

6. The people of Java were able to become farmers because

A. they had been hunters and gatherers.
B. the climate and geographical features were suitable.
C. they could no longer migrate.
D. they could not become industrialists.

7. The main crop of the traditional Javanese farmer is

A. copra.
B. rice.
C. tea
D. rubber.

New Orleans

Name _____

Date _____

1. The people of New Orleans control flooding with

   A. levees.
   B. terraces.
   C. monsoons.
   D. galleries.

2. Creoles are

   A. celebrations with feasts.
   B. a group of people.
   C. leather capes for carrying babies.
   D. tools for harvesting rice.

3. Some plants that did not grow wild in the New Orleans area but were planted by people are

   A. tobacco and rice.
   B. cypress trees.
   C. Spanish moss.
   D. cotton and sugar cane.

4. In an artificial environment, people

   A. change the ecosystem to fit the needs of industry.
   B. adapt themselves to the natural ecosystem.
   C. change the ecosystem to fit the needs of agriculture.
   D. do not change the natural ecosystem.

5. The biggest problem the city of New Orleans has is

   A. garbage disposal.
   B. making landfills.
   C. sinking land.
   D. air and water pollution.

6. As the ecosystem of New Orleans changed, the animals that were <u>best</u> able to adapt were

   A. mice, squirrels, and cockroaches.
   B. bobcats, raccoons, and rabbits.
   C. ospreys, herons, and egrets.
   D. turtles, fish, and alligators.

Item Key for the Comprehensive-Comprehension Test

A key has been provided so that it is easy to discern which items came from the composite-comprehension test and which items were the additional items that covered content common to more than one unit. Each item is classified by a letter placed next to the alternatives. These letters were not present when the subjects took the test.

I - Introduction

K - Kalahari

J - Java

N - New Orleans

M - More than one unit

Comprehensive-Comprehension Test

Name _____

Life in Ecosystems

Choose the one BEST answer and circle the letter on the answer sheet.

1. A food chain is best described as

   A. all the plants and animals in an ecosystem.
   B. a series of steps in which energy is passed by eating and being eaten.
I  C. the animals in an ecosystem that eat other animals.
   D. the plants in an ecosystem that are eaten by animals.

2. The most important idea in the whole text, Life in Ecosystems, is

   A. every ecosystem has people who farm the land in order to get food.
   B. people, plants, animals, geographical features, and climate interact.
M  C. no ecosystem can exist without people.
   D. the climate is more important than the food chains.

3. The difference between the climate of New Orleans and the climate of Java is that

   A. New Orleans is warmer than Java.
   B. New Orleans has more rain than Java.
M  C. New Orleans is cooler than Java.
   D. New Orleans is warmer and drier than Java.

4. People rely upon the natural food chains the most in

   A. the Kalahari ecosystem.
   B. the ecosystem of Java.
M  C. the ecosystem of the city of New Orleans.
   D. all pond ecosystems.

5. Some plants that did not grow wild in the New Orleans area but were planted by people are

A. tobacco and rice.
B. cypress trees.
N C. Spanish moss.
D. cotton and sugar cane.

6. The Bushmen believe the most worthwhile way to live is to

A. raise animals.
B. gather plants.
K C. gather nuts.
D. hunt animals.

7. The interaction among people, animals, plants, geographical features, and climate forms

A. an ecosystem.
I B. a food chain.
C. consumers and producers.
D. an environment.

8. Earthworms, bread molds, and termites are alike because they

A. are all producers.
I B. are all predators.
C. are all decomposers.
D. have chlorophyll.

9. The number and variety of plants and animals have changed the least in

A. the Kalahari ecosystem.
M B. the ecosystem of Java.
C. the ecosystem of New Orleans.
D. all agricultural ecosystems.

10. As the ecosystem of New Orleans changed, the animals that were <u>best</u> able to adapt were

A. mice, squirrels, and cockroaches.
B. bobcats, raccoons, and rabbits.
N C. ospreys, herons, and egrets.
D. turtles, fish, and alligators.

11. The name of a type of tree found in the Kalahari is

A. werf.
B. skerm.
K C. mongongo.
D. baobob.

12. Hunters and gatherers once lived in

A. only the Kalahari ecosystem.
M B. only the ecosystem of Java.
C. only the ecosystem of New Orleans.
D. all three ecosystems.

13. Traditional farmers

A. use machines to plow and dig irrigation ditches.
B. use the kinds of tools and methods their grandparents did.
J C. seek new and better ways to farm.
D. gather nuts and berries in a gotong-rojong spirit.

14. After an antelope is brought home, the Bushmen often

A. rest for several days.
B. move to a new territory.
K C. fight over who gets the meat.
D. have a feast and dance.

15. Examples of plants that grow on the island of Java are

A. mongongo nuts and tsama melons.
J B. wild pineapples and many flowers.
C. cactus and baobobs.
D. cypresses and Spanish moss.

16. People have changed the geographical features the least in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all industrial ecosystems.

17. A large river is important to the people of

A. the Kalahari.
B. Java.
M C. New Orleans.
D. all three ecosystems.

18. The mouse-deer, Pelanduk, in the Javanese story is like the people of Java because he

A. likes to eat plums.
B. uses his brain in order to survive.
J C. is a hunter and gatherer.
D. believes in farming.

19. In order to survive, the Bushmen

A. grow plants that contain water.
B. plant tsama melons and ga roots.
K C. herd antelope and ostriches.
D. gather plants and hunt animals.

20. A blend of several different cultures is found in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all three ecosystems.

21. In the Bushmen story about the hunter and the moon, the sun is described as

A. a friend of life.
B. an enemy of life.
K C. an animal.
D. a peacemaker.

22. People have changed the environment the most in

A. the Kalahari.
B. Java.
M C. the city of New Orleans.
D. the plantations around New Orleans.

23. The driest climate is found in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all industrial ecosystems.

24. The biggest problem the city of New Orleans has is

A. garbage disposal.
B. making landfills.
N C. sinking land.
D. air and water pollution.

25. An example of a Javanese tradition is

A. a story about a mantis and a firebird.
B. a parade through the village.
J C. a shadow play with puppets.
D. choosing a king and queen for Mardi Gras.

26. The number and variety of plants and animals have changed the most in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all pond ecosystems.

27. The Bushmen live in bands that

A. wander only within a certain space or territory.
B. wander all over the Kalahari Desert.
K C. wander outside the Kalahari during the dry season.
D. stay in one place and do not wander.

28. The interaction among people, plants, animals, climate, and geographical features takes place in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all three ecosystems.

29. Rice is grown in

A. levees.
B. paddies.
J C. copra fields.
D. irrigation ditches.

30. Long ago cypress-swamp plants and animals lived in

A. the Kalahari ecosystem.
B. the ecosystem of New Orleans.
M C. the ecosystem of Java.
D. all three ecosystems.

31. The Kalahari is in

A. northern Africa.
B. eastern Africa.
K C. western Africa.
D. southern Africa.

32. In an artificial environment, people

A. change the ecosystem to fit the needs of industry.
B. adapt themselves to the natural ecosystem.
N C. change the ecosystem to fit the needs of agriculture.
D. do not change the natural ecosystem.

33. In a food chain a predator is a

A. producer of chlorophyll.
B. consumer of plants.
I C. decomposer of dead matter.
D. consumer of animals.

34. The correct order for members of a food chain in a pond ecosystem is

A. tadpole, algae, heron, fish.
B. algae, tadpole, fish, heron.
I C. algae, fish, tadpole, heron.
D. heron, algae, tadpole, fish.

35. The land is located closest to the equator in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all industrial ecosystems.

36. Creoles are

A. celebrations with feasts.
N B. a group of people.
C. leather capes for carrying babies.
D. tools for harvesting rice.

37. The main crop of the traditional Javanese farmer is

A. copra.
J B. rice.
C. tea.
D. rubber.

38. Some plants and animals have adapted to the environment in

A. the Kalahari ecosystem.
M B. the ecosystem of Java.
C. the ecosystem of New Orleans.
D. all three ecosystems.

39. The people of the Kalahari

A. sometimes live alone separate from the rest of the tribe.
K B. live outside the Kalahari in the rainy season.
C. travel in bands and each band has its own territory.
D. occasionally war with each other to get new territory.

40. The people of the Kalahari

A. have beliefs based on their hunting life.
K B. do not have celebrations or feasts.
C. are not part of the food chains in the Kalahari.
D. worship the sun, the moon, the mantis, and the firebird.

41. Producers, consumers, and decomposers are found in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all three ecosystems.

42. The people of New Orleans control flooding with

A. levees.
B. terraces.
N C. monsoons.
D. galleries.

43. The wettest climate is found in

A. the Kalahari ecosystem.
B. the ecosystem of Java.
M C. the ecosystem of New Orleans.
D. all industrial ecosystems.

44. The people of Java were able to become farmers because

A. they had been hunters and gatherers.
B. the climate and geographical features were suitable.
J C. they could no longer migrate.
D. they could not become industrialists.

45. The order in which cultures have been developed is

A. agricultural, industrial, hunting-gathering.
B. hunting-gathering, agricultural, industrial.
M C. hunting-gathering, industrial, agricultural.
D. industrial, agricultural, hunting-gathering.

46. All ecosystems have

A. food chains.
B. a warm climate.
M C. people who farm.
D. rivers and hills.

47. The people take only what they need from the environment in

A. an agricultural culture.
B. a hunting and gathering culture.
M C. an industrial culture.
D. an artificial culture.

48. The people change the environment to fit the needs of industry in

A. a natural environment.
B. an agricultural ecosystem.
M C. a hunting and gathering ecosystem.
D. an artificial environment.

49. Birds, plants, and fish are alike because they

A. all kill and eat other animals.
B. are all decomposers.
M C. all use energy that comes from the sun.
D. are all producers.

50. People are different from other animals because they

A. are predators.
B. have adapted to their environment.
M C. are part of food chains.
D. have developed cultures.

Delayed-Comprehension Test

Name _____

1. What is an ecosystem?

2. What is a food chain?

3. What does to adapt to an environment mean?

4. What is culture?

5. What kind of land is found in the Kalahari?

6. What is the climate in the Kalahari?

7. What is the plant life like in the Kalahari?

8. What kind of food do the people of the Kalahari eat?

9. When do the people of the Kalahari move to a new territory?

10. What kind of land is found in Java?

11. What is the climate of Java?

12. How do the people of Java get food?

13. What kind of food do the people of Java eat?

14. How do the people of Java celebrate?

15. Where is New Orleans located?

16. What kind of land is found in New Orleans?

17. What is the climate of New Orleans?

18. What is the plant life like in New Orleans today?

19. How have the people of New Orleans changed their environment?

20. What are some of the problems the people of New Orleans have because they have changed their environment?

# APPENDIX E

## SCORING PROCEDURE FOR THE DELAYED-COMPREHENSION TEST

Scoring the Delayed-Comprehension Test

1. First, correct question one on all the tests. Then correct question two on all the tests. Continue correcting one question at a time until all questions have been corrected.

2. Read the acceptable and unacceptable answers for a question. Then read a student's response. If the student has an answer similar to one of the acceptable answers give him one point. If he has included additional information found in another acceptable answer, give him a second point. A student cannot receive more than two points for any answer.

1. What is an ecosystem?

   Acceptable answers: 1. plants, animals, people, weather, landforms interacting; 2. how producers, consumers, and decomposers live; 3. living and non-living things interacting.

2. What is a food chain?

   Acceptable answers: 1. steps of things eating each other; 2. food is consumed, decomposed, produced; 3. any example.

3. What does to adapt to an environment mean?

   Acceptable answers: 1. to fit into an environment; 2. to change to fit in; 3. to fit in; 4. to change to it;

5. learn to live in a new environment; 6. any example.

4. What is culture?

Acceptable answers: 1. what you eat, how you dress, where you live; 2. the ways of people; 3. ways people do things; 4. traditional ways of doing things; 5. things people do for a long time like ancestors; 6. way of living; 7. customs of people; 8. example of a culture.

Unacceptable answer: 1. what people do.

5. What kind of land is found in the Kalahari?

Acceptable answers: 1. dry; 2. desert or desertland; 3. dry desert; 4. not a lot of plants; 5. barren; 6. little water; 7. flat; 8. desolate.

Unacceptable answers: 1. windy; 2. hot.

6. What is the climate of the Kalahari?

Acceptable answers: 1. very hot; 2. not much rain; 3. 80's; 4. dry; 5. cool in June and July; 6. arid; 7. rains only in two months.

7. What is the plant life like in the Kalahari?

Acceptable answers: 1. baobob; 2. very little or very few; 3. not a lot; 4. bushes or trees; 5. plants that can store water; 6. plants that can go without water; 7. tsama melons or mongongo nuts; 8. desert plants; 9. nuts or berries.

Unacceptable answers: 1. not very good; 2. cactus.

8. What kind of food do the people in the Kalahari eat?

   Acceptable answers: 1. meat or animals; 2. plants; 3. roots or mongongo nuts or tsama melons or nuts or berries or melons; 4. antelope; 5. general description of food, e.g., food that holds juices.

   Unacceptable answer: 1. crops.

9. When do the people of the Kalahari move to a new territory?

   Acceptable answers: 1. food runs out or animals leave; 2. water runs out or water dries up; 3. they don't leave or never leave.

10. What kind of land is found in Java?

    Acceptable answers: 1. fertile soil or rich soil; 2. volcanoes; 3. forests or tropical forests; 4. tropical; 5. hills; 6. wet or moist land; 7. good farmland.

11. What is the climate of Java?

    Acceptable answers: 1. 68-88 range or 60's through 80's or 60-80 or average 70's; 2. hot; 3. warm; 4. moist or damp or humid or wet or rainy or plenty of rainfall; 5. tropical or wet tropical.

    Unacceptable answer: 1. average of 80's.

12. How do the people of Java get food?

    Acceptable answers: 1. raise crops or farm or plant crops or farmers or grow crops; 2. fish or hunt or kill small animals; 3. pick fruits.

Unacceptable answers: 1. hunting and gathering; 2. hunt with poison sticks; 3. suck out of straws.

13. What kind of food do the people of Java eat?

Acceptable answers: 1. rice; 2. plants or crops; 3. animals or meat; 4. fruits; 5. fish; 6. vegetables; 7. pineapple or bananas or berries.

Unacceptable answers: 1. rabbit; 2. mongongo nuts.

14. How do the people of Java celebrate?

Acceptable answers: 1. festival or party or feast or selematins; 2. dancing; 3. food; 4. puppet show or shadow play.

15. Where is New Orleans located?

Acceptable answers: 1. Louisiana; 2. U.S. or Southern U.S. or Southeast U.S.; 3. on, near, by or along the Mississippi River; 4. by Florida; 5. by Texas; 6. by or near the Gulf of Mexico.

16. What kind of land is found in New Orleans?

Acceptable answers: 1. marshy or marsh or wet or moist or swampy or damp or muddy or sinking; 2. polluted land; 3. city type; 4. description of a city; 5. artificial environment.

17. What is the climate of New Orleans?

Acceptable answers: 1. 52-82 or 50's-80's; 2. warm; 3. sub-tropical; 4. cool in fall; 5. not hot, not cold; 6. hurricanes; 7. moderate temperature.

Unacceptable answers: 1. same as Java; 2. rainy; 3. wet.

18. What is the plant life like in New Orleans today?

Acceptable answers: 1. not a lot or scarce; 2. plants found in swamps; 3. some trees and plants or moss or bushes; 4. cypress trees.

Unacceptable answers: 1. not so good; 2. pretty good; 3. lots.

19. How have people of New Orleans changed their environment?

Acceptable answers: 1. changed it to an artificial environment or industrialized or man made or made a city or built homes on swampy land or fit it to their needs; 2. don't depend on nature; 3. drained swamp; 4. destroyed plant life; 5. polluted land; 6. killed off animals; 7. built levees to stop floods.

20. What are some of the problems of the people of New Orleans?

Acceptable answers: 1. animal pests or rats; 2. pollution or air pollution or water pollution; 3. over crowding; 4. garbage disposal or sewage; 5. sinking land.

Unacceptable answer: 1. killing animals.